Railway Age Gazette

Including the Railroad Gazette and The Railway Age

PUBLISHED EVERY FRIDAY BY
THE RAILROAD GAZETTE (INC.), 83 FULTON ST., NEW YORK.

CHICAGO: Plymouth Bldg. CLEVELAND: Williamson Bldg.
LONDON: Queen Anne's Chambers, Westminster.

W. H. BOARDMAN, *President and Editor.*
S. A. SIMMONS, *Vice-President.* RAY MORRIS, *Sec'y and Man'g Editor.*
R. S. CHISOLM, *Treasurer.*
The address of the company is the address of the officers.

Subscription, including regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico.....$5.00 a year.
Canada.....$6.00 a year.
Foreign Edition, London.....£1 12*s.* ($8.00) a year.
Single Copies.....15 cents each.

Entered at the Post Office at New York as mail matter of the second class.

VOL. XLVIII., No. 5. FRIDAY, FEBRUARY 4, 1910.

CONTENTS

EDITORIALS:
Editorial Notes 221
"Cost of Service" in the Alton Case 222
The Per Diem Question 222
Improved Bearings for Machine Tools 223
Supreme Court's Attitude Towards the Interstate Commerce Commission 223
Finishing Locomotive Driving Wheels and Axles 224
New Books 226
LETTERS TO THE EDITOR 226
ILLUSTRATED:
Shop Kinks 229
Darius Miller 242
New Shops of the Central of Georgia 243
Harlem River Branch Improvements; N. Y., N. H. & H. 257
Tool Layout for the Scranton Shops; D., L. & W. 260
Design of Engine Drop Pit and Table; Central of Georgia 264
MISCELLANEOUS:
Pennsylvania Railroad Specifications for Steel Boiler Tubes and Safe Ends 263
Expert Views on Signaling 254
GENERAL NEWS SECTION 265
SUPPLY TRADE SECTION 283

We print this week a collection of shop kinks secured by F. E. Lister, associate editor of the *Railway Age Gazette*, at the Mt. Clare shops of the Baltimore & Ohio. All drawings, photographs and manuscripts for our next prize competition must be in our hands by February 7, and the winning collections will be published in our issue of March 4.

In another column will be found the third of the articles dealing with the arrangement of the new machine shops of the Delaware, Lackawanna & Western at Scranton, Pa. They are interesting because they show not only the tendency of the times but also the tendency, as applied to the equipment of a machine shop, of making a careful study of requirements before a step is taken in execution, and then blazing the way by carefully considered plans. The new plan does away with the old method of depending upon someone's judgment as to about how many lathes and planes will be required for a certain maintenance, a judgment that may have been based on experience in a shop poorly equipped, and grown from small beginnings by innumerable accretions that possessed no semblance of unity. At Scranton the scheme was worked out upon the fundamental basis, in the first place, of a thorough analysis of the time and tool required for the execution of each and every movement that enters into the maintenance and construction of a modern locomotive. This done, these movements or elements of the work were segregated and classified in groups so that work on similar or related parts should be done in the same place, and, as far as possible, with the same tools. The exact relationship between these groups was then studied, and they were so arranged that material which must necessarily pass from one to the other could do so with the least possible resistance and with no retracement of its movement. Finally, the machines of each group have been so arranged with reference to each other that there shall be a steady progress of the work through from one tool to another as it is changed from its rough to its finished condition. That this has been done in the best possible way, and that the last word has been said in the matter, the men who inaugurated and executed this plan would probably be the last to claim. But this much is certain: up to the present no one has made a more thoroughly scientific study of shop layouts, and the result is at least deserving of the most careful and scrutinizing attention of all who may have a similar problem to solve.

We publish in this issue a new specification for steel tubes for locomotive boilers which has just been adopted by the Pennsylvania Railroad, and differs from that of the Master Mechanics' Association in several particulars. The latter was adopted in 1904, when few steel tubes were in use and the manufacturers were not fully informed as to the actual requirements. Since then steel tubes have become more generally used, and their quality has been materially improved, especially their capacity to resist corrosion. Tubes made of steel which is not homogeneous are liable to pit, probably by electrolytic action, and this has been one of the principal objections to them. At present steel tubes for locomotives are made of a fine quality of steel which is specially purified and made uniform in composition, so that their service in respect to pitting compares favorably with the best charcoal iron tube. The Master Mechanics' specification for steel tubes requires them to be cold drawn and seamless, while the new Pennsylvania Railroad specification admits cold and hot drawn and lap welded steel tubes, indicating that the precautions which were thought necessary in 1904 in limiting the process of manufacture to one method, and the most expensive one, are no longer required. The hydrostatic pressure test prescribed by the Pennsylvania Railroad is 750 lbs. per sq. in. for lap welded tubes and 1,000 lbs. for seamless tubes. The lower pressure is amply sufficient for a strength test, but the higher figure is used to detect any defects which would cause leakage in the tubes. The Pennsylvania Railroad specification has very simple chemical requirements, covering only phosphorus and sulphur, and for the latter .04 per cent. is made the upper limit, while the M. M. specification requires the sulphur content to be below .03 per cent. It also specifies the desired per cent. of carbon and manganese, but the Pennsylvania evidently finds this unnecessary, as the strength tests are sufficient to disclose any excess of these elements. The M. M. crushing test requires a section of tube 2½ in. long to be crushed to a height of 1⅛ in. without splitting or cracking, while the Pennsylvania requires the specimen to be crushed flat. The item of 1⅛ in. in the M. M. specification is evidently wrong or obsolete, as it is the common practice to crush these tube test pieces until they are completely flattened. There are other changes in the more recent specification for tubes which might be incorporated in the M. M. specification, and the attention of the committee on Revision of Standards is called to the desirability of doing this. The Pennsylvania specification contains instructions for handling tubes received for inspection and for disposing of rejected tubes, which will be found suggestive.

"COST OF SERVICE" AND THE ALTON CASE.

At a recent dinner of the New York Economic Club, Commissioner Clements, of the Interstate Commerce Commission, attacked the excessive inflation of the securities of the Chicago & Alton, but he attacked it, as usual, on the wrong grounds, while Francis Lynde Stetson defended it, on almost the only grounds upon which it was indefensible.

Referring to the refinancing of the Alton, after the change of management in 1899, and to the stock exchange scandal when John W. Gates got control of the Louisville & Nashville and had it subsequently bought away from him at a large profit to himself, "in both these cases," said Mr. Clements, "the added amount in stocks and bonds was taken out of the pocket of the public in increased rates." We wonder if Commissioner Clements has ever chanced to observe that the Chicago & Alton, running from Chicago to St. Louis and Kansas City, is not the only railway serving these points. As a matter of fact, the territory between Chicago, St. Louis and Kansas City is perhaps the most highly competitive territory in the country, and we beg to inquire what the Wabash, the Illinois Central, the Cleveland, Cincinnati, Chicago & St. Louis, the Chicago, Burlington & Quincy, the Chicago & Eastern Illinois and the Pan Handle-Vandalia were doing while the Chicago & Alton was taking the amount of its increased capital out of the pocket of the public in increased rates between Chicago and St. Louis. It would be interesting, also, to know who chloroformed the Wabash, the Chicago, Rock Island & Pacific, the Chicago, Burlington & Quincy, the Atchison, Topeka & Santa Fe, the Chicago, Milwaukee & St. Paul and the Chicago Great Western while "the added amount in stocks and bonds was taken out of the pocket of the public in increased rates" between Chicago and Kansas City.

Of course, the contention that an isolated road in a highly competitive group can raise its rates for any cause whatever, whether based on its own stern necessities or on the pleasure of the chase, and still do business, is arrant nonsense, and the man that made such a statement is conspicuously unfit to be a member of the Interstate Commerce Commission.

But when Mr. Stetson rose to reply, he attempted to defend the Alton and the Louisville & Nashville financing on moral grounds, which was hopeless. Why there should be so much obscurity in people's minds over so plain a subject as this, is beyond us. In regions where there is either actual or potential railway competition, over-capitalization cannot affect the rates; it can seriously damage the minority stockholder, and, therefore, is wrong morally; it has a bad effect on the financial credit of the railway which is the victim of it, and therefore is bad railway practice. The public using the Chicago & Alton Railway has not been damaged to the extent of one cent by the over-capitalization of this property, but the wings of the Alton were clipped when the transaction took place, because it was thereby denied, for a long period of time, the privilege of obtaining new funds in the world's money market—except at prohibitive cost. Therefore, actual damage was done to the company's credit, but no harm was done, or could possibly have been done, to the traveler and the shipper.

We have discussed the case of the Alton rather than that of the Louisville & Nashville because the principles involved are more sharply pointed. In the Louisville & Nashville affair, the over-capitalization was not serious—a fact conclusively demonstrated by the company's high financial credit at the present time. But the Louisville & Nashville could no more take the increased capitalization out of the public in the form of higher rates than the Alton could. The Louisville & Nashville is a less simple and compact property than the Alton; it has one kind of competition between Cincinnati and New Orleans and another kind between the Birmingham district and the Atlanta district, while, between Louisville and Memphis or Nashville and Memphis, it has still a different kind of competition. But in the whole Louisville & Nashville system there is not one single line which has not some effective competitor, unless we except two or three minute branch lines which are not important enough to attract competition. What would the Queen & Crescent, or the Illinois Central, or the St. Louis & San Francisco, or the Mobile & Ohio have done if the Louisville & Nashville had attempted to increase its rates at the cost of the public? They would have taken all the company's business, and left a very handsome railway entirely idle.

We take this opportunity again to thresh over familiar ground because we are determined to drive from Ireland the snake named "cost of service." Rates are not made in accordance with what the work costs the railway or what the railway would like to earn; they are made on a basis which will permit the traffic to compete effectively in the markets of the world. Oranges from California, Florida and Jamaica compete in New York City, but they are sold on a quality basis, not on a distance basis; the buyer is not at all interested in protecting the railway companies from any loss they may have incurred in competing with a steamship company. If rates were made on the "cost of service" theory there could be no competition in the country at all, since the line with the lowest operating costs would get all the business, and the other lines serving the same points would get none whatever.

THE PER DIEM QUESTION.

The Per Diem Question has always been an obscure one. It only interested railway men, and in its details it interested very few railway men.

One would think that a question as important as this would be fully understood by these few men who were especially interested in it, but unfortunately most of them viewed the question from prejudiced eyes.

As has been said before in these columns, railways can be classified on this car question as "originating roads" and as "distributing roads." The originating roads are those which originate more traffic than they receive. The distributing roads receive more traffic than they originate. The movement of freight enforces the flow of cars from the originating road to the distributing road, and there is nothing to take the empty car back but the per diem rate.

In consequence, the officers of the originating roads feel that the per diem rate should be high; the officers of the distributing roads feel that the per diem rate should be low.

In periods of car surplus, such as we have had recently, the distributing roads are right. The originating roads in general refuse to accept any empty cars except their own and are continually flooding the distributing roads with loaded cars which the distributing roads cannot use after unloading. The distributing road has a continual surplus of its own empty cars standing, which it would like to use, and while it is unable to use these cars it is compelled to pay a per diem rate for unwelcome foreign equipment which is forced upon it. The distributing road is right in feeling that it ought not to have to pay a high per diem rate for cars which it does not want.

But when the situation changes, as it did last fall—when cars become scarce, this position is wrong. The officer in charge of the distributing road then has the whip-hand. He gets a full car supply and he ought to pay a high per diem rate for it. This he will not admit, as he is still suffering from the grievance which he has experienced. Of course, grievances are remembered longer than good fortune.

On the other hand, the officer of the originating road feels his grievance keenly when cars are scarce. He thinks he should have a high per diem rate on the cars which he could use if the distributing roads would only return them. In this

he is right. But when a period of car surplus comes and he is able to relieve himself largely of stored cars he is not prompt to realize that tne per diem rate should go down. On the only occasion when this happened it was vigorously resisted by the most distinctively originating railways.

The action of the American Railway Association in proposing that two rates go into effect—a 30c. rate during the months when a car surplus is usual, and a 35c. rate for the months during which car shortages usually appear—is an indication that both originating and distributing roads are beginning to appreciate the justice of each others' claims. There is every reason why the per diem rate should be high when cars are scarce; there is every reason why it should be low when cars are plenty.

To be sure, this proposition of the association is tardy and grudging. The difference in rate is only 5 cents. It ought to be much more, and it is hoped it will be much more; but the principle at last is recognized that there are two sides to the per diem question, and this is extremely gratifying. It is hoped that the proposition will be promptly carried in the letter ballot which is now being taken.

IMPROVED BEARINGS FOR MACHINE TOOLS.

During the past few years machine tool builders have given their principal attention to improvements in standard machines so as to adapt them to the feeds and speeds made possible by motor drives and the new tool steels. The developments in this direction are such that the requirements and possibilities are well understood and have been realized in many ingenious designs. The process has been carried so far that some tools are burdened with details which wear out or break, and the annoyance caused by such mishaps has resulted in a reaction, and there is now a decided movement toward simpler machines built for a specific purpose with proportions suitable for maximum capacity.

In this new movement more attention will be paid to the material and form of the bearings and to better means of lubrication, as the power consumed and the wear of the parts become more important with high speed and higher pressures. The principal bearings of machine tools may be simply classified as flat and circular. The flat bearings are mainly in the housings and bed plates, and as these often require considerable finish, if the wearing quality is not regarded they will be made of soft cast iron. The tests made at the University of Illinois under the direction of Prof. Breckenridge showed that the average cutting force required to machine soft cast iron was 50 tons per square in., and for hard cast iron 80 tons per square in. It was also shown that any of the new tool steels can work in very hard cast iron at the rate of 25 ft. per minute, but they begin to wear rapidly at 125 ft. per minute. Cast iron or medium hardness can be cut at 125 ft. per minute just as readily as at 70 ft. per minute as far as any injury to the tool is concerned. The aim, therefore, should be to use in the castings for machine tools which are subject to wear a grade of iron as hard as will admit of finish at a reasonable cutting speed, and not to use a soft iron because it can be finished rapidly.

Foreign tool manufacturers have given more attention to the grade of cast iron used for bearing portions, and the complaint of foreigners is that our machine tools generally are made of soft iron. However, some of our manufacturers have regarded hardness for flat wearing surfaces so essential that they have chilled portions of lathe shears and other guiding surfaces, and with the makers of large grinding machines this practice is regularly established. Grinding machines themselves become efficient means of finishing such chilled surfaces. For revolving parts not subject to heavy pressure cast iron, when it becomes glazed, forms the best kind of a bearing, and for this purpose need not necessarily be very hard.

Wrought iron and steel shafts and spindles which run at high speeds should be case-hardened and ground in order to avoid cutting and rapid wear. Shafts or spindles subjected to heavy pressure should have ball bearings. The reduction in friction of shafts by ball bearings was demonstrated in the tests reported by Henry Hess in his paper read at the last meeting of the American Society of Mechanical Engineers. The results of these tests showed that the co-efficient of friction of the counter shaft is usually about three times that of line shafts, and the co-efficient of line shafts fitted with ordinary bearings is about 20 times that of the same shafts when fitted with ball bearings. When ball bearings are used on counter shafts the saving may amount to 70 per cent. of the bearing friction. This is the per cent. of friction work lost in the plain bearings and not of the total power transmitted. The excessive friction of counter shafts is due to the grinding of the hubs, which are usually small, and the pressure per square inch unduly high. These tests also call attention to the advantage of direct motor drive as the best method of eliminating the friction due to counter shafts.

While the internal friction in machine tools is not so important in small tools it must be reckoned with in the larger tools designed for maximum output, and in them there is a combination of high pressure and high speed, and the work performed and horsepower required increases with the speed. The friction loss of a 72-in. boring mill or a 20-in. lathe, when running empty, amounts to about 3 h.p., while a 60-in. planer shows a momentary consumption of 25 h.p. at the time of high speed reverse. Tests of the friction loss of 50 motor drive machine tools in a locomotive machine shop, when doing no useful work, showed an absorption of 40 h.p. in the motors and 20 h.p. in the machine tools, while the same tools at their usual work only required an additional 40 h.p. to drive them.

The other obvious method of reducing friction in machine tools is by improved lubrication, and the substitution of gear wheels for cone pulleys has resulted in radical changes in lubricating methods. The ordinary oil cups are no longer adequate; the gear boxes are made tight and the gears are submerged in oil. This applies not only to the speed mechanism of ordinary lathes, but has been applied to the driving gear of axle lathes and car wheel boring machines, where phenomenal outputs have been obtained. In other machines forced lubrication is used or there is a constant circulation of oil by means of a pump, and in other cases the hollow spindle in the driving head forms an oil chamber, from which the lubricant is distributed to the bearings.

SUPREME COURT'S ATTITUDE TOWARD THE INTERSTATE COMMERCE COMMISSION.

"In considering section 15 in the case of the Illinois Central versus the Interstate Commerce Commission just decided, it was pointed out that the effect of the section was to cause it to come to pass that courts, in determining whether an order of the commission should be suspended or enjoined, were without power to invade the administrative functions vested in the commission, and therefore could not set aside an order duly made on a mere exercise of judgment as to its wisdom or expediency." This, taken from a later case, is the Supreme Court's own view of its ruling in the coal car distribution case, which is printed at some length in our news columns. The coal car distribution case, important in itself, has been given added interest and weight by the opportunity it has afforded for the Supreme Court of the United States to indicate its attitude toward the Interstate Commerce Commission. This is especially timely because of the discussions pending in Congress on President Taft's recommendation for a special court of appeals which will consider only cases involving rulings of the Interstate Commerce Commission.

While the Interstate Commerce Commission has consistently claimed that the courts have had power only to inquire into

the law and not into the facts of an order made by the commission, this view has not been sustained by the various circuit courts of the country. The prevailing opinions of the circuit judges has been that the question of whether an order of the commission is reasonable or unreasonable is a judicial question and not an administrative question. In the coal car distribution case the Supreme Court does not meet this issue perfectly squarely. The general language of the opinion written by Justice White appears, however, to lean strongly toward the view of the commission; that is, that the question of reasonableness or unreasonableness of an order is an administrative question and not a judicial one, and therefore is not subject to appeal and should be finally decided by the commission. This may or may not be a proper interpretation of the court's ruling, but if the law as it is now worded must be so interpreted, it may seriously be questioned whether the people really want such a law. The Interstate Commerce Commission acts as prosecuting attorney as well as judge and jury. A better simile, even, is that between grand jury and petit jury. The Interstate Commerce Commission not only brings indictments, but also sits as a jury to determine whether these indictments are properly or improperly brought. It is humanly impossible for a body of men to act in these two capacities and not be influenced in their action in one capacity by their action in the other.

If the opinion of the Supreme Court in holding "that the powers [of the courts to pass on the unconstitutionality, etc., of a statute] lend no support whatever to the proposition that we may under the guise of exerting judicial power usurp merely administrative functions by setting aside a lawful administrative order upon our conception as to whether the administrative power has been wisely exercised" means that the Act to Regulate Commerce has given to the commission power to determine, without possibility of appeal, the reasonableness of its own order, then the opportunity which may be afforded by a law creating an interstate commerce court for amending the original Interstate Commerce Act, it is to be welcomed.

If such a court was considered necessary when it was thought that the courts would reserve to themselves the power to pass on the reasonableness of the Interstate Commerce Commission orders, it now becomes necessary under our interpretation of the Supreme Court's ruling not only that a new court shall be created, but that it shall be vested with powers to pass judgment on the reasonableness of the Interstate Commerce Commission's orders, and that in so far as the commission itself now has this power, it should be taken away from it. Far, therefore, from lessening the necessity for an Interstate Commerce Commission court, the present opinion of the Supreme Court adds as well the necessity for a legislative curtailment of certain powers of the commission and the transfer of these powers to a court.

It has been assumed so far that the Supreme Court has definitely decided how far the power of the commission extends, but this is by no means an unquestionable assumption. In the coal car distribution case the court was wholly with the commission on the facts in the case. In the opinion of the Supreme Court the commission was right, and the Illinois Central and other roads following its method of coal car distribution were wrong. When, therefore, the court was so fully in accord with the ruling made, it is reasonable to suppose that in writing the opinion of the court Justice White permitted himself to discuss in a general and somewhat oratorical way the principles involved in the Act to Regulate Commerce. But in a case where the court thought the commission wrong on the facts it might hesitate to dismiss the appeal of the railway company on the ground that, although plainly wrong in making an order, the commission would not be overruled because the order in question, while unreasonable, was an administrative one.

Although there is nothing in the opinion to bear out such an assumption, nevertheless it may be highly important that the case is one in which discrimination as to service is involved and not one in which the reasonableness or unreasonableness *per se* of *rates* is involved. The Missouri river rate case, which will be argued late in February when the court convenes after the adjournment, will probably afford far better information as to the Supreme Court's attitude toward the Interstate Commerce Commission than does the present case.

FINISHING LOCOMOTIVE DRIVING WHEELS AND AXLES.

The increase in weight on locomotive driving wheels to 28,000 to 30,000 lbs. per wheel, increased speeds, higher tractive power and larger mileage have combined to wear the driving tires and journals rapidly, and the repairs to these constitute one of the largest items in the maintenance of locomotives. This has been recognized in many locomotive shops by the purchase at a large expense of new and powerful driving wheel lathes, boring mills and hydraulic presses even when appropriations have been denied for smaller tools which are also needed. In pursuing our inquiry as to the output of the principal machine tools in locomotive repair shops we have sent out circulars to many of the principal lines requesting information as to the work performed under normal conditions in ten hours on the above tools, and we have a sufficient number of replies to exhibit a fair representation of present practice on driving wheel work.

The driving wheel lathe has been in recent years wonderfully improved, and when driven by high power, direct-connected electric motors and operated by the new tool steels, its output compared with former practice is something phenomenal. In the past two years we have illustrated tools of this kind made by two of the principal builders. Each of these tools has merits of its own; and tests have been made showing their maximum performance, from which it can be estimated what should be expected from them in every day practice. One of these lathes was driven by a 50 h.p. motor, with a cutting speed of 13 ft., the cut being ⅜ in. and the feed ½ in.; the horsepower consumed at the point of the tool was 27. The lathe was capable of higher speeds with the same cut, but at that time no tool steel was found adequate for the work. A demonstration was made in which the lathe was set complete with a pair of 78-in. wheels ready for work in 12 minutes; the tires were turned in 19 minutes and placed on the floor in 4 minutes, making the total time from floor to floor 35 minutes. In another test with 67-in. wheels and a cut ⅜ in. deep, the total time required was 38 minutes. It is fair to expect, therefore, that this lathe could turn tires up to 78 in. in regular work at a rate of one pair in 45 minutes, and 80-in. tires at the rate of a pair per hour, making 10 per day for large tires and 12 to 14 per day for smaller tires.

This rapid work is materially assisted by the use of special cutting tools shaped to form the finished flange by direct pressure in a right line, instead of the slower work by sharp-nosed tools. The work done by the new lathes is as fast as could be desired, and in many shops one of them would be sufficient. The limiting point is in the cutting tool. Not only does this become heated under heavy cuts, but the pressure due to ½-in. cut, with ⅜ to ½-in. feed, produces a transverse load which requires a large sectional area to resist it, and when very heavy work is attempted the cutting tool is often broken in the shank. Another circumstance which limits the output of high power driving wheel lathes is that the actual cutting is done so rapidly that it is necessary to change the tools frequently, either for dressing or for shaping the flange and rim.

The Wm. Sellers Company has made a radical change in the tool post to overcome this objection, and has placed the different shaping tools in a turret which revolves on the

post. The Niles-Bement-Pond Company abandoned the old tool post with four bolts, and has designed a new tool clamp which has only one screw and permits the tools to be changed rapidly without much labor on the part of the attendant. A sure grip and powerful driver for revolving the driving wheels are also necessary, and these also have been improved and made adequate for the heavier service.

Turning Worn Driving-Wheel Tires

Tool maker.	Output, 10 hrs.
Niles-Bement-Pond, 1905, 80-in., 72-in. diameter outside	5 pairs
" " " 1901, 84-in., 50-in. diameter outside	7 "
" " " 1909, 90-in., av'ge. diam. large and small	4 "
" " " 1906, 90-in., 62-in. diameter outside	5 "
Putnam, 1903, 90 in., 50-in. diameter outside	4 "
Niles-Bement-Pond, new, 1909, 90-in., all sizes, average	7 "
" " " 1904, 90-in., 70-in. diameter outside	8 "
Putnam, 1906, 100 in., 50-in. diameter outside	3 "
Niles-Bement-Pond, 1903, 90-in., 56-in. to 74-in. diam. outside	5 "
" " " 1907, 90-in., 69-in. diameter outside	5 "
" " " 90-in., 56-in. diameter outside	3 "
" " " 1908, 90-in., 62-in. diameter outside	5 "
Putnam, 1907, 90-in., 56-in. diameter outside	4 "

The output of the new driving wheels lathes depends largely on the convenience and rapidity with which the wheels can be placed in the lathe, chucked and removed, as only 50 per cent. of the total operation is actually employed in the work of the cutting tool.

The time required for turning also varies with the diameter and with the irregularity and depth of wear. Comparisons should be made for some certain size, but the wear must be regarded as an average condition. The majority of our records relate to the smaller tires averaging 62 in. Under test conditions the best new tire lathes would turn 12 pairs in 10 hours, but the normal output under ordinary conditions is about 8 pairs of 62-in. tires; and 6 tires of 62-in. diameter is a good average for tire lathes without the most recent improvements. Our reports show that a majority of the shops are turning an equivalent of 5 pairs of 62-in. tires in 10 hours, while a number of them with comparatively new lathes are only getting out 3 or 4 pairs. If the amount of work is so large as to require several lathes which are working at this rate, there is an opportunity to improve conditions, either by forcing the machines to greater output or by the substitution of a new lathe for 2 or 3 old ones.

Tire boring is not such heavy work, as the tires are rolled close to finished size. A large number of tires can be bored per day, and the boring mill is available for turning driving wheel centers. The reports on this work show a wide variation, from 6 or 8 to 40 or 45 tires being bored in 10 hours. Good work should show an output of 30 to 40 tires per day. Forty-five per day is about the practicable maximum.

Boring Steel Tires.

Tool maker.	Output, 10 hrs.
Niles-Bement-Pond, 1905, 50-in. diameter inside	6 tires.
Betts, 1908, all	28 "
Niles-Bement-Pond, 1898, 50-in. diameter inside	20 "
Betts, 56-in. diameter inside	14 "
Niles-Bement-Pond, new, 62-in. diameter inside	11 "
" " " 1900, 72-in. diameter inside	17 "
" " " 1903, 56-in. diameter inside	12 "
" " " 1905, 73-in. diameter inside	45 "
" " " 1906, 81-in. diameter inside	30 "
" " " 1906, 62 to 72-in. diameter inside	40 "
Betts, 1905, 69-in. diameter inside	15 "
Niles-Bement-Pond, 56-in. diameter inside	8 "

The roughing process in turning steel driving wheel centers is heavy work and calls for a strong machine with a powerful drive, and it is this work which has stimulated the improvements in boring mills. Our reports show that two to four 62-in. cast iron centers can be finished per day, and one to one-and-a-half 62-in. steel centers represent average work. This work depends on the roughness of the casting and the hardness of the steel, and two steel 62-in. centers should be regarded as very good work.

Turning Driving Wheel Centers on Boring Mill.

Tool maker.	Output, 10 hrs.
Craven, 1904, 63-in. diameter	1½ steel.
Craven, 1904, 63-in. diameter	2 cast iron.
Betts, 72-in. diameter	1½ steel.
Betts, 56-in. diameter	3 iron.
Niles-Bement-Pond, 66-in. diameter	1 steel.
Niles-Bement-Pond, 44-in. diameter	1½ iron.
Betts, 56-in. diameter	2½ steel.
Betts, 56-in. diameter	4 iron.
Niles-Bement-Pond, new, 62-in. diameter	1 steel.
" " " new, 62-in. diameter	1¼ iron.
Niles-Bement-Pond 50-in. diameter	1 steel.
" " " 1900, 62-in. diameter	½ steel.
" " " 1900, 62-in. "	1 iron.
" " " 1903, 62-in. "	⅔ steel.
" " " 1903, 44-in. "	1¼ iron.
" " " 1903, 72-in. "	2 steel.
" " " 1903, 57-in. "	3 iron.
" " " 1906, 72-in. "	1 steel.
" " " 1906, 52-in. "	1¼ iron.
" " " 1905, 56-in. "	1.4 steel.
" " " 1905, 56-in. "	1.5 iron.
Betts, 1905, 44-in. diameter	1½ steel.
Betts, 1905, 44-in. diameter	3 iron.
Niles-Bement-Pond, 56-in. diameter	1 steel.
Niles-Bement-Pond, 60-in. diameter	1½ iron.

Turning New Driving Axles.

Tool maker.	Output, 10 hrs.
Niles-Bement-Pond, 1903, Journal, 9 x 12½ in.	4 steel.
" " " 1901, " 9½ in.	3½ "
" " " 1909, new" 8 in.	3 "
Bullard, 1902, Journal, 10 in.	1 in 10 hrs., 1 in 6½ hrs.
Butmann, Journal, 9½ in.	2 steel.
Lodge & Shipley, Journal, 10 in.	2 "
J. Bertram & Son, 1904, Journal, 9 in.	3½ "
Niles-Bement-Pond, 1888, Journal, 10 in.	1 "
" " " 1888, " 10 in.	1 iron.
" " " 1905, " 8 and 9 in.	3 steel.
" " " 1896, " 10 in.	4 "
Sellers, 1883, Journal, 9 in.	3 "
Sellers, 1883, Journal, 7¼ in.	4½ iron.
Bullard, Journal, 8½ in.	1 steel.

Our records for 12 shops which rank among the best in the country include one which reports 4 steel axles 9 in. in diameter, one which reports 3½ axles 9 in. in diameter, two which report 3 steel axles 8 in. and 9 in. in diameter, and one which reports 4½ iron axles 7¼ in. in diameter. Four of the shops report only 1 steel axle in 10 hours, and some others report only 2. This variation of from one to four in the output shows the vast possibilities for improvement in about one-half the shops. That the reports disclose that 50 per cent. are well up to the mark set as the capacity of new tools is certainly a good showing. For turning new driving axles many repair shops use the ordinary lathe built years ago for miscellaneous work, but the belt is narrow and the gears weak, so that heavy cuts cannot be taken. Special lathes for locomotive axles built in recent years have 5½-in. belts, with driving gear wheels in proportion. When driven by a direct connected electric motor the capacity of the motor is 25 h.p., and an axle lathe which can use nearly this amount of power should finish axles rapidly. These lathes have two tool posts, so that both ends of the axle can be turned at once. When kept in nearly continuous operation, with few delays in changing axles or fitting the cutting tools, these lathes should turn out 4 to 5 steel axles with 9½-in. to 10-in. journals in 10 hours; their normal output will be 3½ to 4 axles.

Mounting Driving Wheels and Axles (Hydraulic wheel press).

Tool maker.	Time.	No. of men.	Total cost
Putnam, 1902, 90 in.	1½ hrs.	2	$0.25
R. D. Wood, 1909	⅓ "	2	.15
Niles-Bement-Pond, 600 ton	¾ "	2	.36
Putnam, 1903, 300 ton	1 "	0	.60
Niles-Bement-Pond, 400 ton	... "	4	.95
" " " new, 600 ton	1 "	4	.68
" " " 1901, 300 "	2 "	3	.90
" " " 1904, 400 "	½ "	3	.34
" " " 1908, 400 "	1¼ "	2	.65
Chambersburg Eng. Co., 1906, 600 ton	1 "	2	.30
Putnam, 1906, 300 ton	1½ "	4	1.32
Putnam, 1905, 400 ton	1 "	2	.62
Hydro Press Co., 1907, 600 ton	1¼ "	2	.50

In mounting cast iron centers and driving axles up to 9 in. diameter there is little difficulty with 300-ton machines, but the steel centers and 10-in. axles require higher pressures, and the more recent machines have a capacity of 600 tons. There is more difficulty in pressing off the steel centers with the low power presses, and the variation in time required for this work is due to the necessity of drilling the axle or heating the center. The lack of sufficient pressure also accounts for the longer time required by some roads to mount driving wheels and axles, and here, too, the methods of handling the wheels at the press largely affect the time required for the work. The actual time the press is in operation is only a few minutes, while the time reported for mounting is usually over one hour. One shop reports as low as one-third hour and a cost of only 15 cents, while with others the time is one and one-half to two hours and the cost 65 to 90 cents.

With the high power presses there should be no difficulty in mounting the largest axles with steel centers in a half hour at a cost of 25 cents.

Tire Heating.

Fuel.	Diameter of tire.	Time, minutes.	No. of men.	Cost. Fuel.	Wages.	Total.
Oil	56 in.	35	2	$0.15	$0.29	$0.44
"	63 "	30	3	.86	.38	1.24
"	All	45	2	.20	.24	.44
"	72 in.	120	2	.30	1.00	1.30
Gas	62 "	21	2	.30	.20	.50
Oil	All	..	3	.10	.42	.52
Gasolene	.....	..	3	.21	.45	.66
Gasolene	72 in.	45	3	.51	.50	1.01
Gasolene	56 "	45	2	.58	.42	1.00
Oil	79 "	60	2	.05	.30	.35
Gas	56 "	30	2	...	.50	...
Gasolene	62 "	90	2	.44	.70	1.14
Gas	56 "	60	3	2.25	.56	2.81

The reports relating to tire heating are interesting, as they show a variety of methods and a wide variation in costs. The time consumed varies from a half hour to two hours, and the cost from 35 cents to $2.80. A fair average for good work may be taken as 45 minutes with a cost of fuel of 30 cents and of labor of 50 cents, or a total cost of 80 cents.

We have not included in our inquiry the auxiliary work on drivers which is performed in the quartering machine or that in cutting key ways. The average time on quartering machines may be taken as 3 hours per pair of drivers; and in cutting key ways by double key way cutters one hour per axle may be regarded as good work.

NEW BOOKS.

Watkins on Shippers and Carriers. By Edgar Watkins, LL.B., of the Atlanta (Ga.) Bar. T. H. Flood & Company, Chicago, 1909. 578 pages; 6⅛ in. by 9⅜ in. Price, $6.

The law governing the relations of shippers and carriers has, within recent years, attained in the United States an unprecedented interest and importance for the traffic managers as well as for the counsel of both railways and all classes of industrial and mercantile concerns. Mr. Watkins states that it was his purpose to write a book that would be of equal use to the lawyer and the traffic man. He deals, however, not with the broad subject of the law of commerce, but with the somewhat narrower one of the law governing the transportation of interstate freight.

The law of shippers and carriers is at once one of the oldest and one of the newest parts of Anglo-Saxon jurisprudence. The very essence of this part of the law is, and always has been, the requirement that the rates of carriers shall be reasonable; yet what constitutes reasonableness in rates is being litigated in numerous cases now pending in the courts of this country. In this state of the law it is not possible for the text-writer to make dogmatic statements about many important matters. Mr. Watkins has recognized this fact, and instead of attempting to deduce exact principles from the various inconsistent and often conflicting decisions, he has generally quoted from the decisions themselves, and left the reader to put his own interpretation on them. When the decisions of the courts have not covered a particular point he has resorted to the opinions of the Interstate Commerce Commission for light. The chapter headings indicate the scope of the work. They are: "Validity and Scope of the Act to Regulate Commerce"; "All Charges for Services Rendered by Common Carriers Must Be Just and Reasonable"; "Equity in Rates"; "Enforcement of the Act by the Commission"; "Enforcement of the Act by the Courts, Including a Discussion of the Effect Given by the Courts to the Orders of the Commission"; "Power of the Courts of the United States to Prevent an Illegal Advance in Rates"; "State Laws or Regulations Affecting Interstate Transportation," etc. Mr. Watkins does not confine himself to the "Act to Regulate Commerce," but treats of all federal statutes affecting interstate commerce, including the safety appliances acts, the Sherman anti-trust act, and the 28-hour law.

Letters to the Editor.

RUN, REPAIR OR TRANSFER.

Chicago, Jan. 26, 1910

To the Editor of the Railway Age Gazette:

I read with interest in your issue of January 21 the report of the paper read at the meeting of the Western Railway Club, Chicago, on October 19 by Wm. Baird, shop superintendent of the C., B. & Q., entitled "Twentieth Century Inspection" or "Run, Repair or Transfer," dealing with the delays caused to loaded cars at terminals by the refusal of receiving lines to accept them, owing to defects.

In the discussion following I observed that no reference was made to the important point as to who should assume the expense in connection with the transferring of the loads in bad order cars. To my mind, the only objection to our present "Chicago" rule is the fact that the receiving line must, in addition to making the transfers, in all cases assume the expense incidental to so doing.

There are instances when it is necessary for the receiving line to send out its wrecking derrick in order to get damaged loaded cars received from their connections to thier repair or transfer tracks, and men well versed in Chicago interchange have questioned the intent of Rule No. 3 of the General Superintendents' Association's rules governing interchange of cars in Chicago, as to whether, in such cases, the receiving line should be expected to accept these cars and assume all the expense in connection with the transfer. The rule is clear, however, and covers all loaded cars, irrespective of their condition, and it would not be questioned if the rule went further and made proper disposition of the expense involved in handling such transfers and charging it to the delivering line.

Formerly, the Chicago rule did not require the receiving line to accept bad order loaded cars when the cars were consigned within the switching district, but if the present rules are observed all such cars must now be accepted, and if the car is unsafe to handle and cannot be repaired under load the receiving line must bear the expense of the transfer, notwithstanding the only revenue it receives is the small switching charge. In view of this, it occurs to me as particularly important that rules be promptly adopted to make a fair disposition of the expense involved in transferring loads, for while it is true the reciprocity consideration to some extent offsets this injustice, it is nevertheless a fact that under existing conditions the burden of this expense falls more heavily on some roads than it does on others.

Car Service Rule No. 15 of the American Railway Association, covering the disposition of the cost of transferring loads, could not be more equitable or consistent, but the difficulty with this rule in its present shape is that it is only optional and is therefore not generally observed.

The rule of "Run, Repair or Transfer" as a factor in reducing delays is gaining favor each year, and in the near future the Master Car Builders' Association will doubtless insert in its Code of Interchange Rules a rule requiring the acceptance of all loaded cars at all interchange points. As a suggestion, when this is done let the rule be to the effect as follows:

Loaded cars offered in interchange must be accepted.

(If, on account of bad order, transfer of load is necessary, the cost shall be borne as provided in car service rule 15.)

Eliminate the optional phrase of car service rule 15 by omitting the words, "unless otherwise agreed" and make the rule read as follows:

The cost of transferring the lading of freight cars at junction points shall be settled as follows:

First—The delivering road shall pay cost of transfer.

A—When transfer is due to defective equipment that is not safe to run according to M. C. B. rules.

B—When transfer is due to contents being improperly loaded or overloaded according to M. C. B. rules.

C—When transfer is due to delivering line not desiring its equipment to go beyond junction points.

Second—The receiving road shall pay cost of transfer.

D—When cars exceed load limit or cannot pass clearances or be moved through on account of any other disability of receiving line.

E—When receiving road desires transfer to save cost of mileage or per diem.

Would not this be the means of making the desirable rule of "Run, Repair or Transfer" mandatory at all interchange points; consequently reducing delays, and at the same time place the burden of expense covering the cost of transferring the loads of bad order cars where it rightfully belongs?

F. G. CHAPLIN,
Chicago & North Western Ry.

LIMITED SPEED OF PASSENGER LOCOMOTIVES.

Boston, Mass., Jan. 31, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Nothing that has appeared with reference to locomotives for high speed passenger service in any railway publication is more important and apropos than your recent article on the limited speed of passenger locomotives. There has been, apparently, no appreciation among locomotive designers of the importance of obtaining more cylinder capacity from locomotives by some other means than by a mere increase in size. As far as I know there has been only one American who appreciated this, and that was the late George S. Strong, who spent many years in exploiting a four-valve locomotive. Mere increase in size of cylinders is not only objectionable *per se*, but it carries with it extra work for propulsion due to friction, back pressure and excessive compression on augmented piston area, to say nothing of inertia effects. It also means increased wire drawing because the piston area increases with the square of the diameter and the port area can hardly keep pace with it.

In 1888 I wrote a paper on the distribution of steam in the Strong locomotive for presentations to the American Society of Mechanical Engineers, and which was printed in Vol. 9 of the Transactions. In that paper I called attention to the importance in high speed work of fuller indicator diagrams than those given by the single valve, and illustrated the matter with typical diagrams from the Strong and common locomotives. The Strong diagrams in some cases showed about double the area of the common locomotive diagrams.

The Strong locomotive received but little consideration from railway companies and builders, but it had in view correct ideals. The design was carried out in such a manner that it was bound to be troublesome, and in the case of the four cylinder balanced compound locomotive the trouble was worse than with the two cylinder locomotive. The most serious trouble with the steam using parts was leakage of the steam around the valve seats, each valve having a removable seat, and in the compound the seats were very unstable. This was because there were in one cavity three valves and three seats. This engine ran well and economically for a short time after the valve seats were fitted. The valves used by Strong were of the gridiron type and were meritorious in themselves, and the actuating gear was not troublesome. The inlet and exhaust valves had independent motions and there were two reverse levers in the cab. Familiarity rendered the latter unobjectionable.

I believe that locomotive designers should now realize that an express locomotive is a large steam engine and should be designed with the same objects in view that are constantly before the designer of a high-class stationary engine, viz., economy and a full indicator diagram. I do not advocate the Strong locomotive, but I do advocate one which shall accomplish all that Strong had in view. To do this I advocate the Corliss valve, with two inlet and two exhaust valves for each cylinder. The Walschaerts link should be used and should be double so as to have one sliding block for the inlet valves and alongside of it another for the exhaust valves. Two rods should run forward from the blocks and take hold of the lap and lead connection from the crosshead, and thence two rods should connect with the valve cranks. The valves would, of course, be on top of the cylinder and would be double or triple ported. There would be two reverse levers, one for the inlet and the other for the exhaust valves. The former should have a closely and continuously notched quadrant in order to change the cut-off as desired, and the other should have a center notch and one or two notches at each end. The valves could be easily balanced by means of strips similar to those used on the Richardson valve, if thought desirable.

By means of a mechanism of this kind the inlet functions will not be mixed up with the exhaust. Late exhaust with full exhaust port opening could at all times be realized. There would also be late exhaust closure and consequent absence of excessive compression. The sum total of these features would be to produce an indicator diagram that is fuller than those from the present locomotive on the steam line, that holds on to the steam better at the end, and that has a lower exhaust line and a full heel. At high speed I should anticipate nearly twice the area of the typical indicator diagram. These valves should be made with as much lap as possible in order to remain tight a long time.

There is no reason for anticipating any difficulty from a valve gear of this kind. The valves can be made of the hardest iron and ground to perfect shape and finish, and with a special boring mill the ports can be rapidly and accurately bored. If it is desired, the valve seats can be made of special iron.

Now, who will be the first to build such a locomotive?

F. W. DEAN.

Reading, Pa., Jan. 31, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have noted recent articles in the *Railway Age Gazette* regarding the high speed of American trains, also the editorials on the limit of speed of passenger locomotives, and in each it is claimed that with the ordinary locomotive we cannot run trains much above 60 miles per hour, sustained speed.

I have also noted that in the comments defending the high speed made at different times in this country it is necessary to go back twelve years for a record on the Atlantic City Division of the Philadelphia & Reading Railway between Atlantic City and Philadelphia to cite an instance of sustained speed of 70 miles per hour.

The case cited was in 1898, when the lightest and flimsiest passenger equipment was in service, and, although the train consisted of five cars, the total weight of same, including engine and tender, was only 303 net tons. The time for the trip from start to stop was 47½ minutes, or an average maintained speed of 70.8 miles per hour, while the record given shows that the fastest mile was made in 42¾ seconds.

In 1906 ten heavy Atlantic type engines were built at the Reading's own shops, having cylinders 22 in. in diameter by 26-in. stroke, carrying 235 pounds of steam and having driving wheels 86 in. in diameter.

In the summer of 1907, or the second year that these engines

had been in regular service, the 4 o'clock train out of Camden on the Atlantic City Railroad was 9 minutes late in starting, nevertheless it arrived at Atlantic City—55.6 miles distant—exactly on time, or at 5 p.m., making the run in exactly 41 minutes, which is equivalent to an average sustained speed of 81.3 miles per hour.

The train consisted of one six-wheel-truck combination car, five six-wheel-truck coaches and two Pullman cars. The weight of the entire train, including engine and tender, was a little over 605 net tons.

In this case we have practically doubled the weight of the train which was run in 1898; the speed has been increased from a trifle over 70 miles per hour to 81.3 miles per hour, and the run was made in exactly six and one-half minutes less time.

I hardly think the position taken by some of the writers in your paper is justified by facts. These large Atlantic type engines frequently run a mile in 36 seconds, which is at the rate of 100 miles per hour.

The latest design of engine—the three-cylinder Atlantic type—has yet to be tested out to its fullest capacity; nevertheless, it has already demonstrated that it can outrun and outpull the engine that I have above cited, which maintained an average speed of over 80 miles an hour in regular service. an average speed of over eighty miles an hour in regular service.

H. D. TAYLOR,
Supt. M. P. & R. E., Philadelphia & Reading Ry.

Land Title Building, Philadelphia, Jan. 29, 1910.

To the Editor of the Railway Age Gazette:

The writer is greatly pleased to note that the subject "Limited Speed of Passenger Locomotives" has been deemed of sufficient importance to warrant a discussion, as is evidenced by the letter of Lawford H. Fry and your reply entitled "High Speed and Heavy Rolling Equipment."

Notwithstanding the notable instances of high speed performance to which Mr. Fry has called attention, the writer believes it to be a fact that our modern passenger locomotives are incapable of high speed with the heavy trains of the present, although at moderate speeds they are very efficient.

As your editorial makes clear, the performance of the Vauclain compound locomotives on the Atlantic City Railroad, although creditable, would not meet the requirements of the present, for the reason that the total weight of a modern train with accommodations for the same number of passengers would probably be 60 per cent. greater than those mentioned. The recent remarkable performance of the three-cylinder simple locomotive on the Philadelphia & Reading can probably be ascribed to the following reasons: the total weight of the engine is very slightly greater than that of the 21 in. by 24 in. two-cylinder engines of that line; the balancing must be superior with three cranks at 120 degrees, both of which would tend to a reduction of internal resistance, while the total cylinder volume has been augmented by approximately 16½ per cent. In this three-cylinder engine, piston valves have been employed and the bore of the cylinders relative to the stroke of the pistons has been greatly reduced.

These features should produce somewhat lower percentages of cylinder clearance volume, so that it is probable that, although the total cylinder volume and power have been augmented by 16½ per cent. the weight of steam used has not been measurably increased. Hence, the gain in power at high speed.

The writer believes that Mr. Fry's contention that a satisfactory steam distribution in a balanced compound locomotive can be had with a single valve for both high and low pressure cylinders, is questionable, although it is true that this arrangement makes a very good make-shift.

With a single valve, long, tortuous port passages are a necessary evil, which not only involves large clearance volumes, amounting to, in one case, which came to the writer's notice, 18 per cent. and 12 per cent. respectively of the piston displacement of the high and low pressure cylinders, but must create considerable frictional resistance to the passage of steam, as well as large condensation losses, due to the large areas of the enclosing walls.

The writer is heartily in accord with the editor and believes that a separate valve for each cylinder is far the better arrangement, as with individual valves the cylinder design can be worked out in such a manner that all necessary heat losses can be reduced to a minimum.

You have indicated that the only changes from year to year have been in the nature of enlargements, which have entailed large increases of internal resistance and call attention to the fact that no improvements in steam passage or valve gears have been made, and in your concluding paragraph you suggest that in the discussion which is to follow, the concrete question "What can be done to so improve a locomotive which reaches its limit of speed of 60 miles per hour on straight level track that it will haul the same train at 70 miles per hour?" be considered. This question suggests to the writer, that if the locomotive be using all the steam which can be passed through its cylinders and exhaust nozzle at the given speed, something must be done to improve the use of the steam between the throttle valve and the exhaust nozzle. The above conclusion eliminates the boiler from consideration and assumes that it is capable of supplying all the steam which can be used.

It is a well-known and recognized fact that clearance is a large source of loss in air compressors and, as a consequence, the valves are located in the cylinder heads and every detail which conduces to low clearance volume is carefully looked after in the design. Whatever applies to the air compressor applies with equal, if not greater force to the steam engine, where condensation losses are large at the best. The writer endeavored in a communication, which was published in your issue of January 14, to make clear that it is possible to augment the power of a given locomotive as much as 12 per cent. without any increase in the weight of steam used and while his former communication was purely theoretical, he firmly believes that it is possible to do this and even more if we only employ the proper means.

In order to get the maximum available power from a given weight of steam, it is imperative that clearance volumes be reduced to the lowest possible limits, so as to get the largest possible piston displacement for a given total clylinder volume, and at the same time to so design our cylinder that the port passages shall be short and direct, exposing the least possible areas of enclosing wall surfaces on which the steam will condense.

But with the valve events of our present gears it is not advisable to reduce the percentage of cylinder clearance below 7 per cent. or 8 per cent. of the piston displacement, with which sufficient compression results to suit the mechanical needs of the engine. Therefore, as we are limited as to clearance by our present valve gears, it becomes necssary to devise a mechanism by means of which valve events suitable to a reduced clearance may be had before any marked improvement in the efficiency of high speed locomotives can be expected.

Suitable valve events have been obtained with at least one gear of which the writer has knowledge, but as the mechanism did not prove durable in service, they have never been extensively applied. However, the writer thinks that the problem is one which will readily yield to careful study and good designing, and, in fact, is confident that he already has the solution. Nothing now remains but a demonstration, which the writer hopes to have an opportunity to make in the near future.

CHAS. F. PRESCOTT,
Mechanical Engineer.

Shop Kinks.

FROM THE MT. CLARE SHOPS OF THE BALTIMORE & OHIO.

BY F. E. LISTER,
Associate Editor of the *Railway Age Gazette.*

A number of tools and methods of doing work in the locomotive and car departments of the Mt. Clare shops of the Baltimore & Ohio are given in this issue. In this connection, we are greatly indebted to A. P. Prendergast, master mechanic, who extended every possible courtesy, advising his separate shop foremen, who successively assisted in the individual shops.

To W. P. Spade, shop specialist, we are also greatly indebted. In this position he is especially interested in shop kinks, which, broadly speaking, are along the line of his particular endeavor. It has been due to his energy and resourcefulness, the result of several years of valuable experience as a mechanic and supervisor in a number of railway and industrial machine shops, that many changes in tools and methods looking to greater efficiency have been instituted in these shops. Mr. Spade was particularly courteous, and has since forwarded photographs and drawings and valuable data, which are included.

It has been thought of more advantage to show tools by halftone illustrations rather than by line cuts, and this has been done where possible. Our belief is that the shop foreman is in search of working ideas more than actual detail drawings, which latter easily follow to accord with the specific shop conditions.

STRAIGHTENING STEEL UNDERFRAMES.

Steel underframe and all-steel car construction has necessitated, on the part of the repair department, some additional thought and scheming to keep down the cost of repairs. At the Mt. Clare shops of the Baltimore & Ohio they have a scheme for straightening steel underframes of wooden box cars, which is not only cheap in material, but is also so in point of time. For instance, a certain car had been in a fire and had lost its entire superstructure. When the car arrived at the shops it was found that its underframe had drooped considerably. To dismantle the frame for individual straightening of the members would have taken about six days.

The method used in this instance was to turn the frame upside down and rest it upon three rails placed, at the ends and in the middle, across and a few inches above the track. A wood fire was then made under the drooped section of the frame, and when heated sufficiently it became straight, due to the action of its own weight. This same method has been used with frames which would not straighten of their own weight, in which cases it is but necessary to lift the frame by both ends and allow it to fall upon the rails, which later act as a face plate. An underframe is straightened in this way, using six men, including crane hands, in about ten hours, at a cost of a little more than 10 per cent. of that it would cost to dismantle the frame, straighten the individual members separately and reassemble the frame.

STRAIGHTENING CENTER SILLS OF STEEL TANK CARS

Steel tank cars are often sent to the repair yard with about 6 in. of clearance at the truck bearings on one side of the car, while those on the opposite side are tight together. This is, of course, on account of a twisting of the center sills due either to a derailment, rolling down an embankment, rough handling by the wrecker, or all combined. Were it necessary to remove the center sills it would require holding the car out of service about a week.

At Mt. Clare such a job of repair work requires only about five hours' time. The two high corners of the car are chained to the rails. The low corners are then jacked up until they are on a level with the high corners, all measurements being made at the side bearing. A wood fire is then made under the section of the center sills where the twist occurs, and when sufficiently heated the metal responds to the strain put upon it by the chains and jacks. An oil burner may also be used for the heating. The twist usually comes about the middle of the car where the frame bracing is the least.

WASTE PRESS.

Probably one of the greatest oil losses about a railway shop is that which results in connection with its use for journal box waste packing. The common method is for a man to obtain, by requisition, several pounds of waste and a quantity of oil. He then saturates the waste and packs the journal boxes, after squeezing out by hand what he considers to be the unnecessary oil. The judgment of different men varies widely as to the necessary oil content, with a consequent loss in most cases.

The press shown herewith, Fig. 1, is one which was first gotten up at the Mt. Clare shops, but is now used in all the

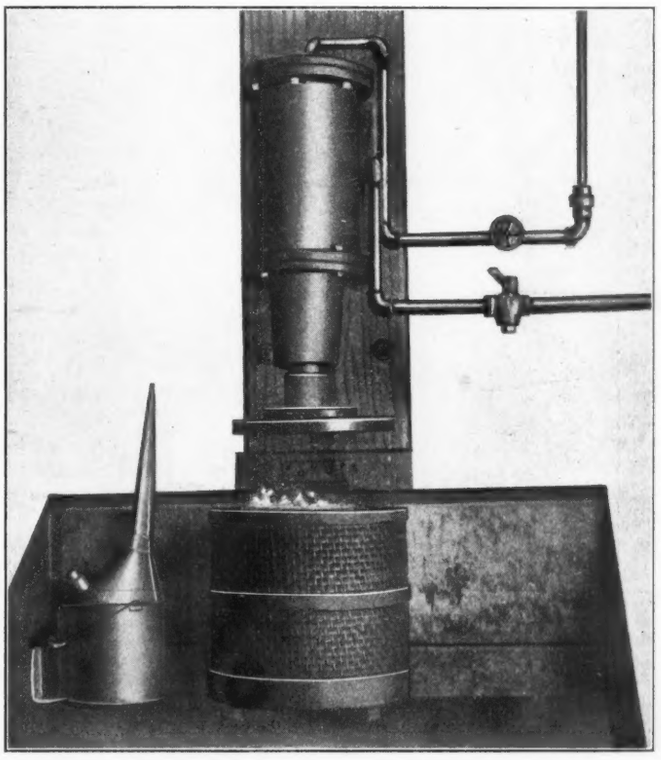


Fig. 1—Waste Press.

shops of the Baltimore & Ohio. The wire basket, into which the saturated waste is placed, is about 14 in. high and 16 in. in diameter. An ordinary 8-in. freight car brake cylinder is mounted on a rack above the wire basket. A piston is secured to the end of the rod, and this is driven down upon the basket filled with oily waste. The basket sits on a tinned floor which drains into an open oil tank. Air pressure at about 60 lbs. is used. On being taken from the basket the waste is thoroughly soaked with oil, but there is no loss from drippings. By this method, all waste for journal boxes is alike as regards the oil it carries, and only about 60 per cent. of the oil formerly used is required. The waste press, also, is in charge of the oil house man, which provision alone tends toward a saving.

TABLE FOR PAINTING SASHES.

Probably the last place to find a shop kink is in the paint shop, as there seems to be but very little occasion for them, as the painting of coaches and parts does not permit of many short cuts. The illustration herewith, Fig. 2, however, is one which seems rightly a kink, for it is certainly a cheap,

home-make device for facilitating work. It is used for painting sashes. The sash is placed upon the four rubber rests so that the woodwork does not come in contact with them. The stem of the top plate provides for revolving the sash so

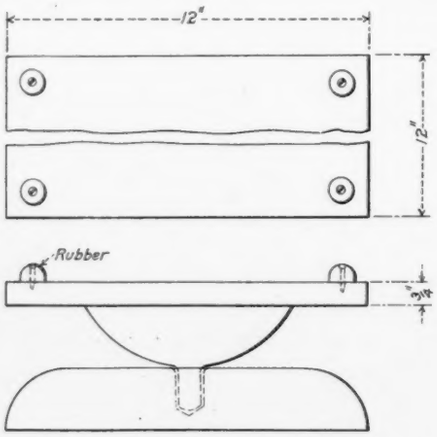


Fig. 2—Table for Painting Sashes.

that the workman is not required to reach around it, but revolves the sides successively for painting.

ELLIPTICAL SPRING COMPRESSOR.

The half-tone illustration, Fig. 3, and the detailed drawings, Fig. 4, show a passenger coach shop kink, which is undoubtedly one which should find a place in every shop where there is not some better scheme for compressing the elliptical springs

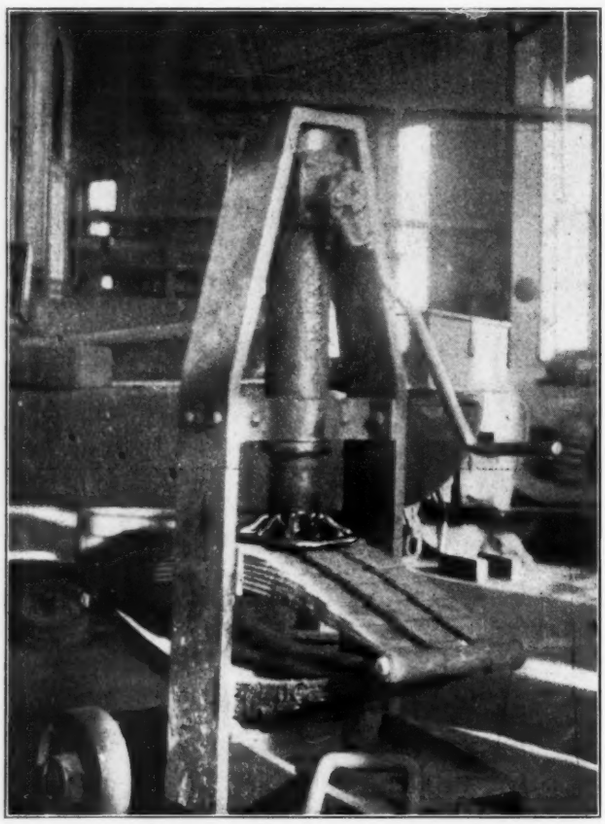


Fig. 3—Elliptical Spring Compressor.

for coaches before placing them in the trucks. It is a matter of hard work, with screw or hydraulic jacks, to place a spring in a truck without some method of compressing and holding it to its loaded height.

The detailed drawings show this compressor to be a tool easily and cheaply made, comparatively little machine work being necessary. The main machining is confined to beveling off the flanges on one side of the I-beam section from which the base plate is made. The upright is made of 1-in. x 6-in. wrought iron, forged to the shape shown, with the ends meeting on the under side of the base plate, to which it is securely

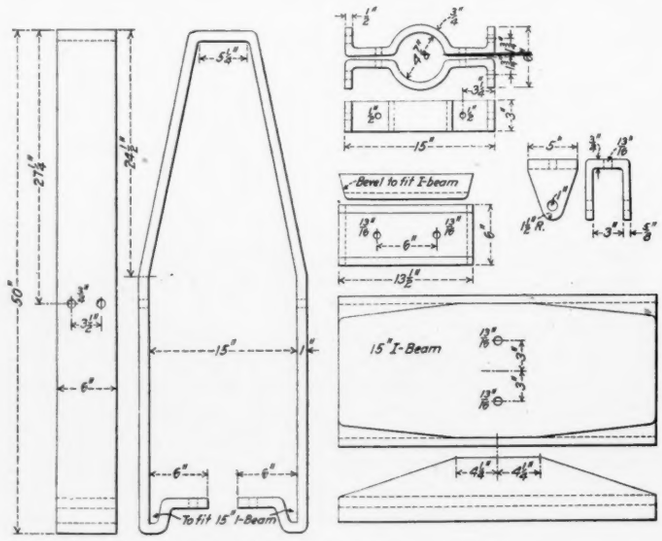


Fig. 4—Details of Elliptical Spring Compressor.

fastened by ¾-in. bolts or rivets. The inverted jack is fastened at the top and also held by the double clamp.

A spring is compressed slightly below its loaded height and then two solid round iron links are slipped over the end of the springs. These links, one of which is shown in the illustration, hold the spring compressed, while placing it in its position in the truck. After it is finally placed and the weight of the truck upon it, the links are easily removed.

Being mounted on wheels, the spring compressor is easily taken to any part of the shop.

MATERIAL AND TOOL CHECKING CASE.

The system of material and tool checking used in the tin and pipe shop at Mt. Clare is a departure from those generally found.

In the illustration, Fig. 5, is shown a case containing 200 pigeon holes, each 2 in. x 2 in. x 4⅞ in. When a man desires a tool, he writes the name of the tool on a 1¾-in. x 4¾-in. ticket and signs it. Each ticket has been previously dated by the tool room attendant. Before delivering the desired tool, the attendant gives the mechanic its number, who indicates this on the ticket before releasing it. Each tool is also stamped "Pipe Shop" in large letters. This prevents their being turned in at other tool rooms by mechanics, with whose tools they have been gathered up in other shops. The lower portion of the case is alphabetically arranged, and the ticket is deposited in a pigeon hole under the letter of the mechanic's name. When the tool is returned to the tool room the card is given to the mechanic, who destroys it and places the pieces in a box inside the tool room window placed there for that purpose. All tools are returned at quitting time each day, and if needed again are drawn out on the following morning.

With this system there is no chance for changing, commonly called switching, of tools, as all are numbered and when returned must correspond to the number and kind of tool drawn. For instance, a man drawing a 14-in. Stillson wrench, No. 41, must return the same tool, and is prevented from substituting another wrench, although it be of the same kind. This same rule, of course, also applies to stocks, dies, cutters, monkey wrenches, screw drivers, chisels, hammers, chain tongs, and all tools used in the pipe shop, as they are all numbered and marked.

Another very creditable feature in this system is that when

tools are lost or mislaid the mechanic can find out, at the tool room, the tool's number and make a systematic search for it, at the same time notifying the tool room attendant that he has lost or mislaid the tool. It is then listed on the "lost tool sheet," and the tool room attendant watches for the tool's being returned by another mechanic. The result is that but very few tools are lost, as they are eventually found and returned.

The same case is also used to record all material charges to locomotives, cars and general shop orders. It effectually prevents wrong charges being made. An instance in point was illustrated when a man gave a locomotive number which did not correspond to any locomotive in the shop at that time.

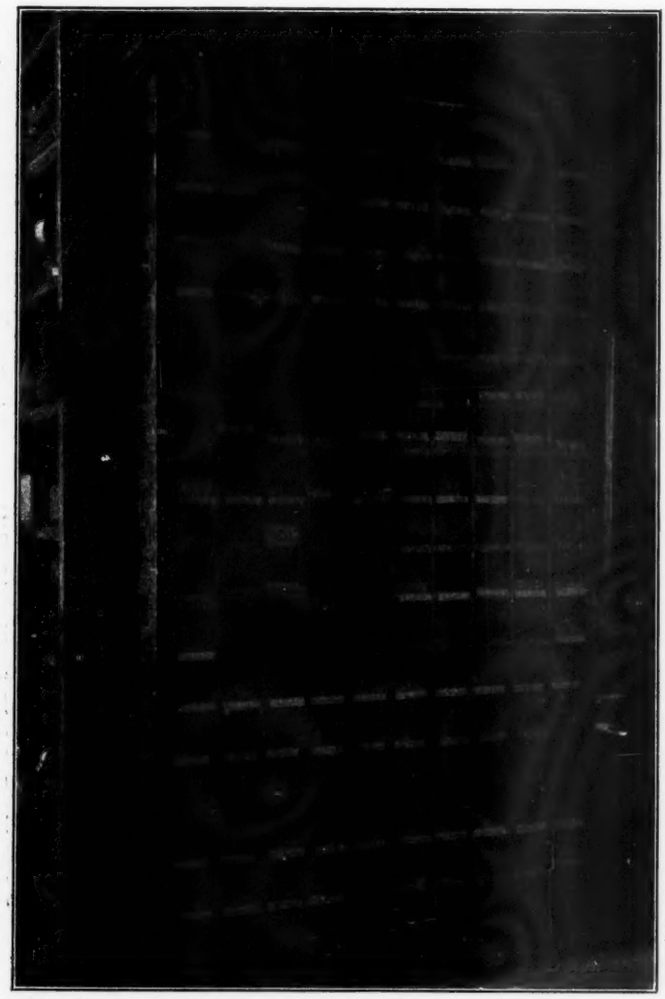


Fig. 5—Material and Tool Checking Case.

He had transposed the figures, but this mistake was caught by the tool room attendant.

The upper portion of the case is reserved for orders on locomotives, cars, and for special shop orders of all kinds. When it is desired to get material from the storehouse the man writes a list of the material required on a ticket, or tickets if necessary, with the proper designation number. The tool room attendant compares this designation with the numbers in the case, and if it does not appear, the man asking for material is required to correct it. The order is written on the storehouse material card by the tool room attendant, who gives this order to the one wanting the material, and files the original ticket in the case. By this method charges are correctly kept, no improper charges being permitted to pass the tool room window. When the shop, locomotive or car order is closed, the tickets are placed on file for future reference, which gives the shop a record in each case.

This system was devised by Wm. Magee, foreman pipe shop, who supplied the description given above.

AIR HOSE NIPPLE TESTING MACHINE.

Air hose nipples are tested in the pipe shop on the device here illustrated, Fig. 6. The air cylinder is used merely to get an air tight joint in closing the ends of the nipple. After the nipple is in place air is admitted into it. The nipple is

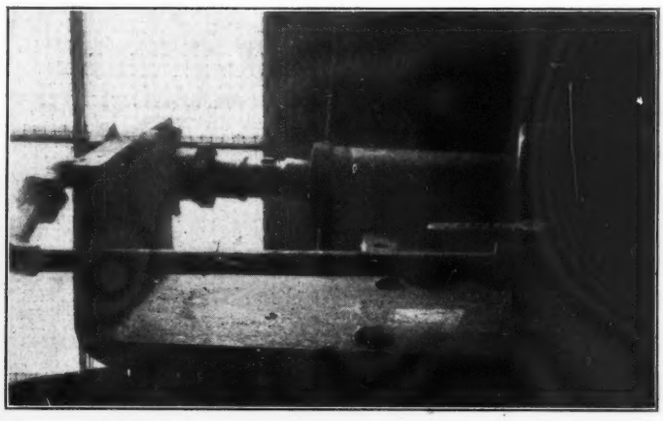


Fig. 6—Air Hose Nipple Testing Machine.

then coated with soapy water and any leaks in the metal at once make themselves evident.

This is probably as simple and yet effective test as could be devised, and the machine itself is made from practically discarded material.

SPRING BAND STRIPPING PRESS.

Spring bands are stripped from the leaves with the machine, or press, shown in Fig. 7. The spring is placed as shown

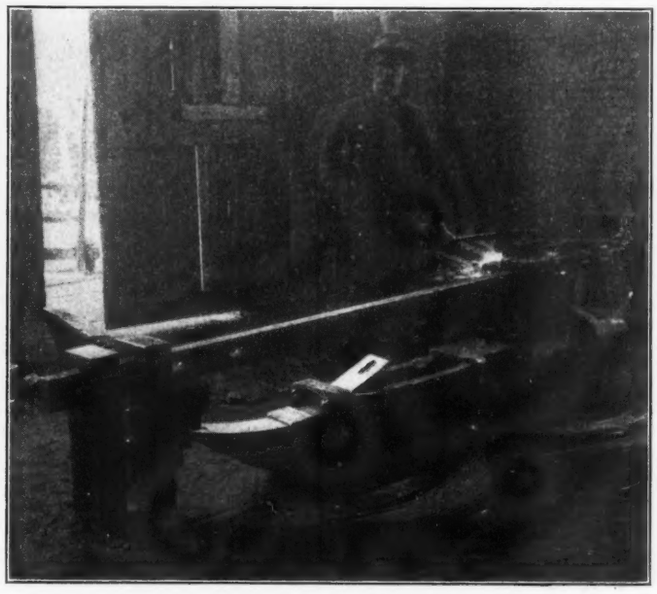


Fig. 7—Spring Band Stripping Press.

and these two metal plates are clamped against the sides of the spring by a solid U-clamp. These plates bear against opposite sides of the band and extend to contact with the hydraulic piston. The photograph shows a stepped stop for taking various sized springs.

BLACKSMITH SHOP FORGINGS.

The illustration shown in Fig. 8 is of a case in the Mt. Clare blacksmith shop, which contains samples of the standard forgings used on locomotives and cars. A collection of the actual forgings in a case which is accessible to every blacksmith in the shop, is certainly far better than a file of blue prints of the pieces, as a mechanic in the shop can more easily

make a forging from a sample one than he can from a blueprint.

Each forging is numbered and these numbers correspond to the names of the pieces given on the following list. The list shows a comparison between the cost of making these forgings by hand and the cost when making them by machines. As the actual amount of money involved in each case is not necessary for this comparison, we have expressed the machine forged cost saving in per cent. of the hand-forged cost, the latter being considered 100 per cent. in each case. In those cases of pieces which are still hand-forged or always have been machine forged, no cost savings are, of course, given. Small forgings are listed in lots of 100 pieces.

SPRING CHAMFERING ROLLS.

The ends of spring leaves are chamfered at Mt. Clare on the machine here illustrated, Fig. 9. It was made entire at these shops and consists of two cast-iron uprights which carry the bearings of the rolls and support the gearing, belt and flywheel. The rolls are supplied with elliptical bases which are set to close upon the spring leaf at the same time. The end of the leaf is first heated in an oil furnace and chamfered sufficiently by three blows of the rolls, resulting in an even draw of the metal.

CORNER OF SPRING SHOP.

The half-tone, Fig. 10, shows a corner of the spring shop at Mt. Clare. In the background is seen the face plate table and in the foreground, the air cylinder arrangement for giving the leaves their proper set. This machine will set two leaves at a time, after which they are passed into the tempering bath without further heating. The testing department

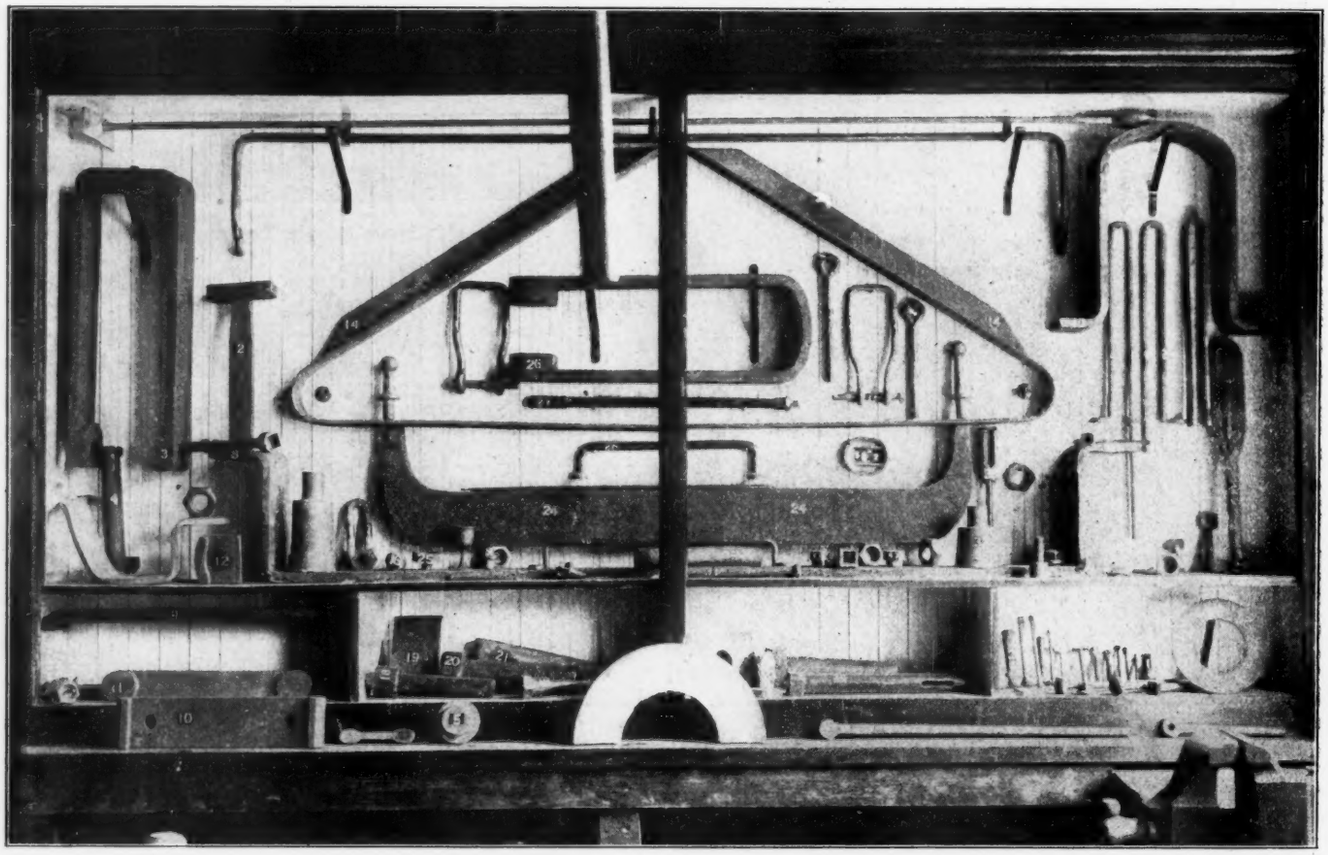


Fig. 8.—Blacksmith Shop Forgings.

LIST SHOWING NUMBERS OF FORGINGS, WITH PER CENT. SAVING WHEN MACHINE-MADE, HAND-FORGED COST BEING 100 PER CENT.

No.	Name of parts.	Pieces.	Mach.-frgd, per cent. saving
1.	Uncoupling lever for engine and tender	1	64.3
2.	Boiler brace crow foot	1	50.0
3.	Tender draw-bar yoke	1	80.7
5.	Collar nut, Class E-24	1	60.4
6.	Brake-shaft stands, Class M-8 cars	1	92.7
7.	Knuckle-pin and cross-head pin nuts	100	93.1
8.	Top bolster piece, Class 3-A 5-6	1	76.5
9.	Miner draft-gear yoke, Class M-11	1	91.3
10.	Carrier iron, Miner draft-gear	1	75.0
11.	Boiler sling brace	1	66.6
12.	Radial yoke end	..	....
14.	Pilot band	1	75.4
15.	Socket wrench	1	68.3
16.	Crank-pin bolt	100	99.0
17.	Truck and body lever connection—B. P. 1245S	1	50.0
18.	6-in. and 12-in. jack screws	100	96.1
19.	Radial drawbar yoke end	..	....
20.	3-in. hexagonal head bolts	100	90.6
21.	Dead lever guides—B. P. 6911	100	....
22.	Boiler plug	1	95.3
23.	Flexible staybolt spuds	100	....
24.	Crown bar, Class E-16	1	40.0
25.	Compression grease cup	1	60.0
26.	Westinghouse draft-gear yoke	1	73.4
27.	Radial staybolts	100	....
28.	Round lever guide for tender	1	83.3
29.	⅞-in. brake-hanger eyes, bent & welded 1 heat	100	53.1
30.	⅝-in. grab iron for all freight cars	100	50.0
31.	Flexible staybolts forged instead of turned.	100	....
32.	Knuckle-pin	1	1.7
33.	Flue-welding job on machine	..	....
34.	Tail-pins punched	100	75.0
35.	3-in. square head bolts	100	95.5
36.	Blow-off cock handle	1	94.9
37.	Follower plate	100	....
38.	Fulcrum jaw for caboose car	1	72.9
39.	Hand-rail column	1	57.1
40.	Steel car spring hanger, Class N-8 9	1	92.0
41.	Live lever guide with collar	1	84.6
42.	Live lever guide without collar	1	86.3
43.	Drawbar loop	..	....
44.	¾-in. brake-beam hanger output, increased from 900 to 2,150 per day, the loop of hanger increased from 450 to 1,000 per day	100	22.2
45.	Brake-hanger key bolt punched	100	95.2
46.	Flexible staybolt cap nut	100	93.7
47.	Flexible staybolt spud	100	....
48.	Radial staybolt cap nut	..	....
49.	Westinghouse air pump valve	1	....
50.	Welded eye bolt	100	64.0
51.	Bent eye bolt	100	62.5
52.	Boiler safety cap	1	52.4
53.	Boiler rivets	100	....
54.	Crown-bar bolts	100	....
55.	Center plate liners	100	....
56.	⅜-in., ⅞-in. and 1-in. patch bolts	100	92.0
57.	Fire rakes	1	58.5

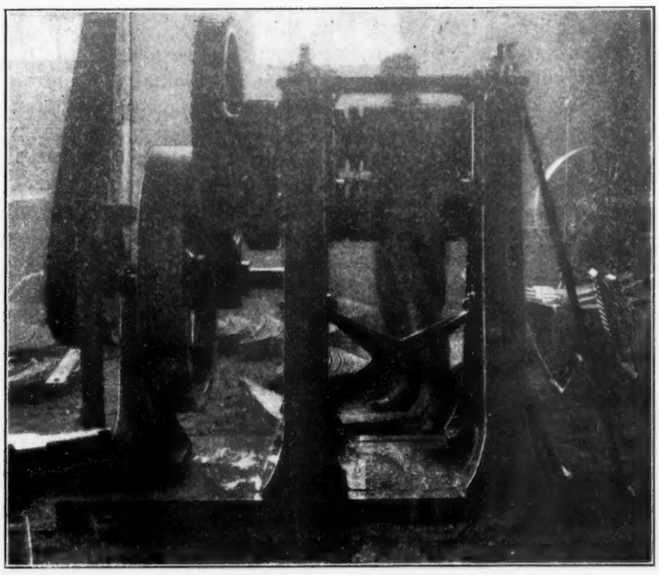


Fig. 9—Spring Chamfering Rolls.

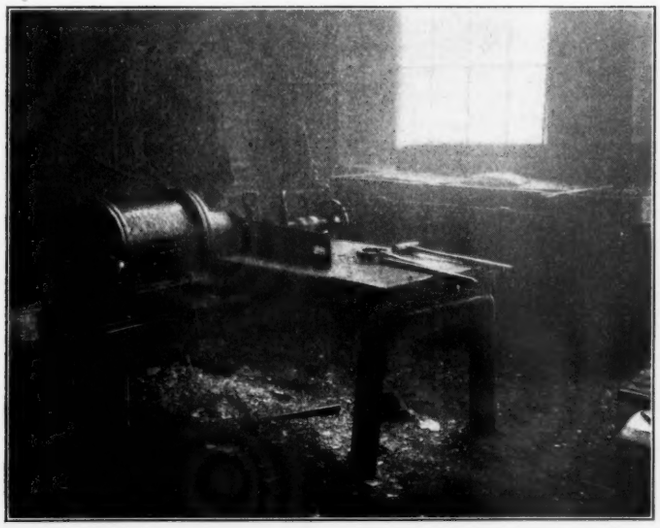


Fig. 10—Corner of Spring Shop.

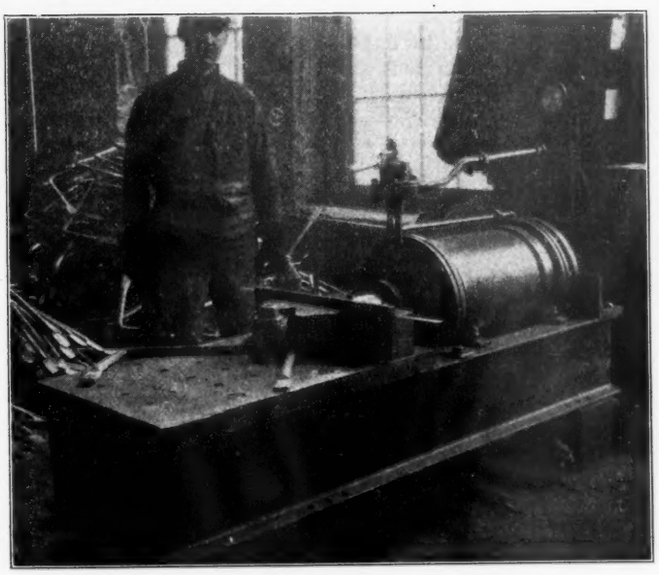


Fig. 11—Bulldozer for Light Work.

must pass on every spring before it goes into service. Each spring is placed, inverted, upon a table and pressed until the band reaches the table. After being released, a spring is sent back to the blacksmith shop for resetting if it be ¼-in. too high or ½-in. too low.

BULLDOZER FOR LIGHT WORK.

The bulldozer shown in Fig. 11 is a cheap but very effective tool for handling light wrought iron shapes. An ordinary brake cylinder is mounted between the two I-beam sections, such that the dies will slide on the face plate. Various shapes of dies may be used, the one shown being for making right angle bends. This work is handled cold, as are the shapes down in the background. Other pieces handled are car steps, brake staff steps, coupling pin lifter rods, engine hooks, chain links, angle iron reinforcing bars, etc.

STAYBOLT BREAKER.

The staybolt breaker, shown herewith in half-tone illustration, Fig. 12, and in line drawings, Fig. 13, is a boiler shop kink which shows a high state of perfection. At first glance, one would say that the device is too large and heavy, but as

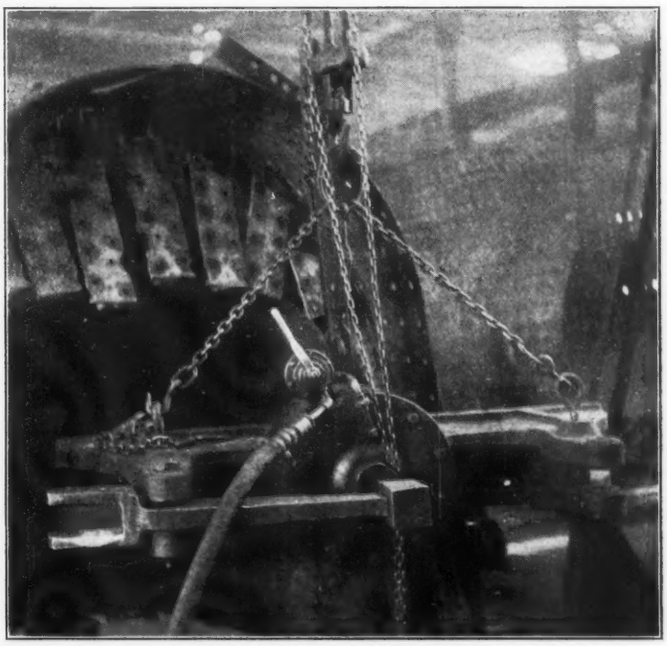


Fig. 12—Staybolt Breaker.

it is intended to be handled by a crane and suspended on chains when being used, its weight is of no moment.

This breaker differs from the general run of such tools, which remove the staybolts by striking a blow, as it breaks the bolts by exerting a pulling strain until the metal shears. The pulling rod, shown in the upper left hand corner of the sketch, has A dimensions of 4 ft., 6 ft., 9 ft., 12 ft. and 15 ft., and are made in rights and lefts. The main part of this rod is made of wrought iron with a tool steel end welded on, which latter forms the hook for taking hold of the bolts. The rough wrought iron sleeve slides on the puller rod. With the wrought iron steel pin, this sleeve is quickly made fast at any desired point along the rod, and the pull is effected by this sleeve bearing against the sides of the stirrup-shaped end of the lever.

In using, the breaker assumes about the position shown in the half-tone. The rod is then run through the stirrup and the hook placed over a stay bolt. The sleeve and pin are then slipped into position and air admitted to the cylinder. When used on the short bolts in the waterleg, the hook is placed at about the middle of the bolt, which bends a little and then shears off at both sheets. In the case of the long radial stays, however, the hook is placed as near as possible to the outside

sheet and the bolt shears at this sheet only. The bolt, therefore, remains in the firebox sheet, but as the box is to be removed and usually scrapped, this makes no difference. The ends of the bolts remain as plugs of the holes of the outside sheets, but these are easily knocked out afterward.

It will be noted on the drawing that the ⅞-in. eye bolts, by which the breaker is handled, are cast in, making them permanent, with no danger of loosening, due to the heavy strains which come upon them.

The wrought iron lever at its power end fits loosely into the stirrup on the end of the piston rod. The breaker is made for using on either side of the boiler, it being necessary only

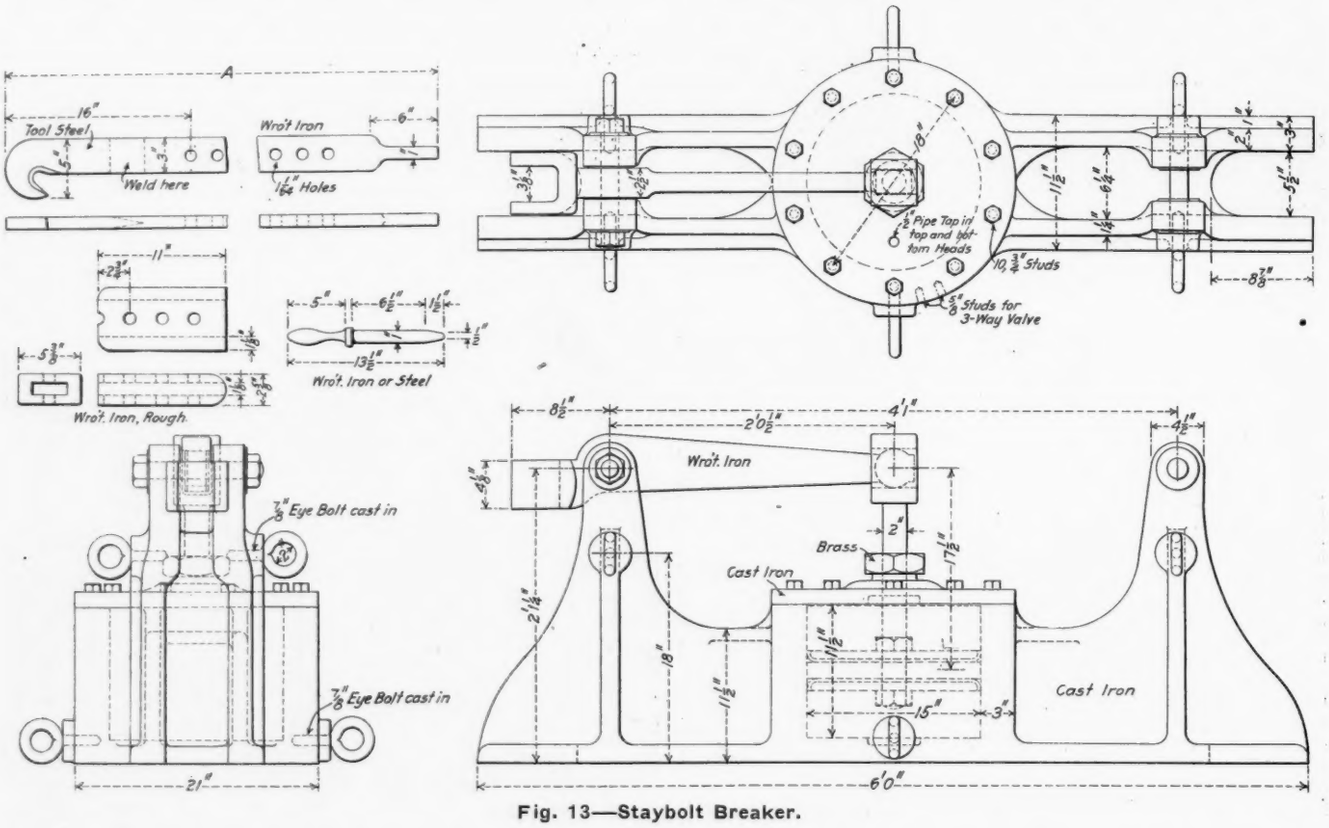


Fig. 13—Staybolt Breaker.

to remove the fulcrum bolt and shift the lever to the other side.

The air-controlling valve, shown in the half-tone illustration, is a three-way valve, moving 60 deg. on either side of the central or lap position. These two extreme positions open communication with opposite ends of the cylinder.

With this breaker, a box having 1,800 bolts may be cut out in 14 hours. New men are used on the job, the newer one of the two required operating the air valve.

CROWN BEARING GAGE.

The customary way in a large number of shops for laying off crown bearings for driving boxes preparatory to slotting or turning them for the box fit is to place the brass on the box in the position which it will assume for pressing into place and then scribing off on the edge of the brass the line of fit. This method is generally satisfactory, but it is almost impossible to press the brass into the box without using a file to get the proper angle at the retaining shoulder.

The gage here shown, Fig. 14, which, in reality, is an inside caliper with three legs, is designed for laying off the proper angle of the retaining shoulder. The three legs are adjustable to the requirements of any brass for from 6-in. to 10-in. journals. The central adjustable leg always moves along a radius line, being guided by a fixed pin, while the other two legs are free to be adjusted to obtain the proper angle at the retaining shoulder. It will be noticed, from the sketch, that these latter legs are adjustable in two directions. The plate is made of sheet iron about 1/16-in. thick.

All driving box brasses at these shops are turned on a lathe for the circular fit, using a specially designed mandrel. Brasses are much more easily turned to size on a lathe than machined on a slotter, since it is impossible for the mechanic to caliper the finished sizes of the brass on a slotter until an entire cut has been made, while in the case of a lathe, it was only necessary to make one or two revolutions in order to caliper the bearing.

CENTERING AND DRILLING MACHINE.

The accompanying half-tone, Fig. 15, shows an old 30-in. Bement-Dougherty lathe, which had served the purpose for which it was originally designed, and was lying idle in the shop, although it was in a fair state of repair.

Crank pins in this shop are roughed out of old engine axles, leaving about ⅛-in. to finish. At this rate each axle will make from three to four crank pins. The axles are first nicked in as far as possible with a cutting-off tool on the

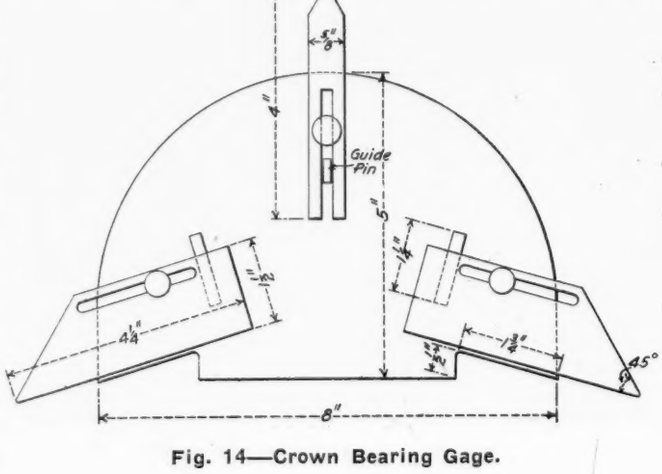


Fig. 14—Crown Bearing Gage.

roughing lathe and are then broken apart with a hammer. It was the usual practice then to center them at the drill press. A great many of the pins required a 1⅜-in. hole to be drilled through them for the washer bolt. This, when drilled on the lathe, caused considerable trouble in placing and removing the steady rest and also in locating the clamps to hold the pin on the line center during the drilling operation.

This old machine was fixed up to overcome the unnecessary

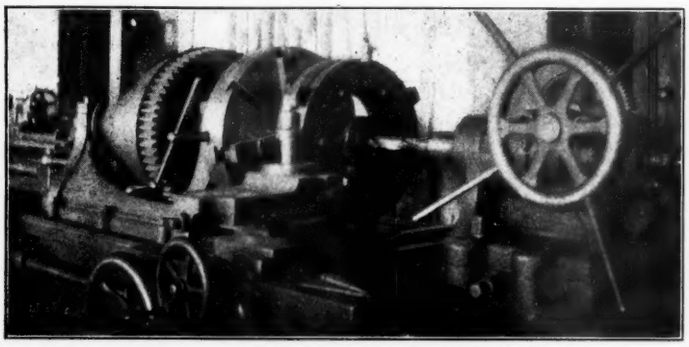


Fig. 15—Centering and Drilling Machine.

work of the old method and also to save time and labor in the process. A heavy 21-in. geared scroll chuck is seen on the spindle. The steady rest is free to be moved along the ways to accommodate any length of work up to the full capacity between the centers. The jaws of this steady rest are moved in and out by a scroll ring, making them self-centering. A crank pin is placed in the chuck on the spindle, the jaws of which are then closed tightly. The jaws of the steady rest are then closed and locked with a clamping screw, after which the pin is faced to the finished size. The tail spindle, carrying a drill, is then brought into use and the center drilled and reamed, after which the pin is ready for the lathe, which will finish the body. In case the pin requires a 1⅜-in. hole through it, it is first faced and counter-bored for the nut space. The tail stock carrying the drill is then used for drilling. The drill feed is geared so as to make very rapid movement of the drill in withdrawing it for cleaning. The four outside spokes on the hand wheel facilitate this operation.

Should the centers in piston rods require drawing, this machine is also very useful by placing a flat pointed drill in the tail stock spindle fit. The center is quickly drawn, avoiding the use of a gouge. Although this machine has been in use but a short time, new kinds of work which it will handle and at about 50 per cent. of their cost on other machines, are continually being found. The cost for drilling crank pins has been reduced about 60 per cent. This machine is, of course, kept in readiness for doing this kind of work only, so that the heavy geared scroll chuck and the steady rest chuck are always in place.

The illustration herewith shows a crank pin and a drill in place.

SHOE AND WEDGE CHUCKS.

In the accompanying half-tone, Fig. 16, is shown a method of holding locomotive shoes and wedges for the final operation of planing the face and edges after the castings have been returned, popmarked, from the erecting shop.

Much difficulty has been experienced in these shops in the matter of setting and holding shoes and wedges to the popmarks, as the faces of the frame legs do not always wear at right angles, often being as much as $\frac{1}{64}$-in. and $\frac{1}{32}$-in. out of true. This necessitates the use of wedges and chims in chucking, which on account of the repeated blows of the planer tool, are very difficult to keep in place. This method also requires considerable time in setting the job.

The chuck here shown was designed by W. P. Spade, shop specialist at the Mt. Clare shops, to overcome these difficulties and it meets the requirements admirably. The chuck is made of cast iron, and, as is seen in the illustration, tongues are cast integral, which fit the T-slots of the planer bed. The chuck is made in two pieces so that it can be opened or closed to accommodate castings from 12 in. to 24 in. in length, or, in fact, of any required length. This arrangement permits of chucking the work at its ends to obtain the greatest holding power. Instead of using the regular round-pointed pins for the outside set screws, pins shaped similar to a flat chisel are used. This provides more holding surface than would the round pins, and the flat surfaces do not leave unsightly marks, which is especially the case when using pointed pieces on brass shoes and wedges. The flat pins effectively prevent slippage, which is more pronounced when working soft metal such as brass. Round points forge into the metal from the continual shocks of the tool, especially when it is cutting at a rate of about 40 ft. per minute. The pins are forced against the work by ordinary set screws and the opposite sides bear against the sharpened edges of steel plates, which are held in place by this pressure and grooves cut in the center section of the chuck. These plates, which point slightly downward, are 4 in. long and 1 in. wide. Their position is shown in the illustration.

The vertical adjustment of the castings is obtained through four set screws, by which the strips upon which the casting rests, are raised or lowered. Spreader bolts are placed be-

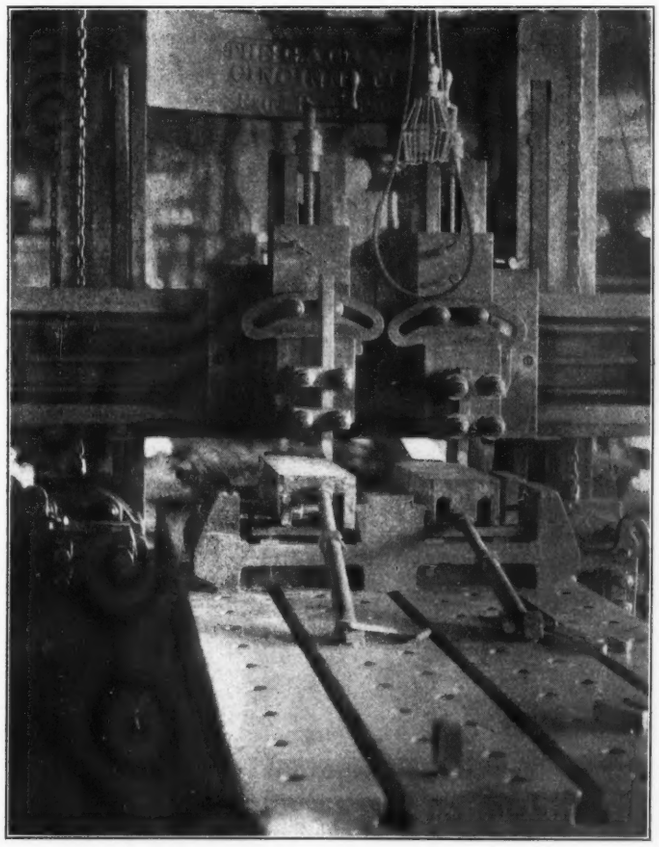


Fig. 16—Shoe and Wedge Chucks.

tween the flanges to prevent the possible spring of the flanges. The jacks seen in the foreground are used merely to absorb the shocks of the tool and have no particular effect in holding the castings in place. These are made of 1-in. bolts and pieces of 1-in. pipe.

An increase of 80 per cent. in output and much better work has resulted from the use of these chucks.

CLOSE QUARTER RATCHET.

The detailed drawings herewith, Fig. 17, show a design of

3¾-in. close-quarter ratchet. It was designed in a Baltimore & Ohio shop where it was not possible to work in closer quarters than 5 in. with the ratchets in stock, and these 5-in. ratchets were useful only with forged square shank drills. It was also designed to make use of the short twist drills which had accumulated as a result of their long service.

The Morse taper socket, the ratchet and the feed screw, are seen to be in one piece. The tang of the drill extends through a slot into a counterbore to provide for removing the drill. The hardened center in the feed sleeve has a left-hand thread and a hexagon nut which seats upon the top of the sleeve. This center is freely fit into the sleeve as it is necessary to

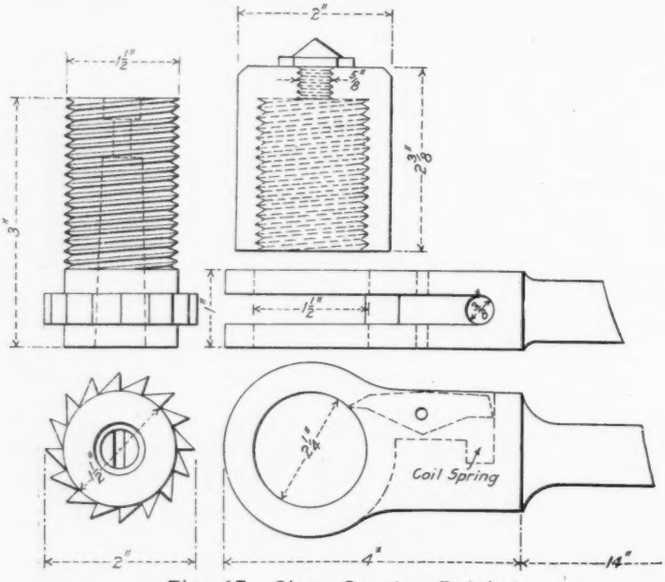


Fig. 17—Close Quarter Ratchet.

remove the center when knocking out a drill. The ratchet dog is fulcrumed on a $\frac{3}{16}$-in. pin, extending through both sides of the head, and it is held in contact with the ratchet wheel by pressure from a ⅜-in. coil spring, as indicated. The handle in one side of the head is made in one piece, while the other side of the head is a separate plate, riveted or securely bolted in place.

CHUCK FOR SHAPING DRIVING ROD BRASSES.

The assembled and detail drawings herewith, Fig. 18, show a chuck for machining driving rod brasses on a shaper.

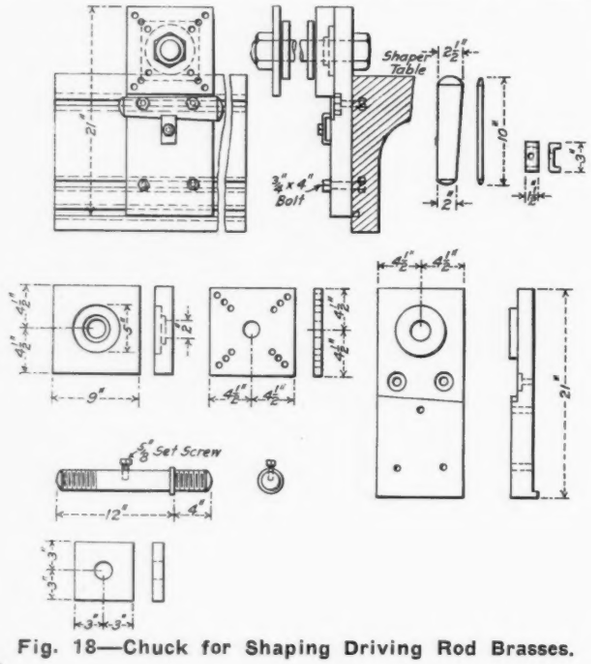


Fig. 18—Chuck for Shaping Driving Rod Brasses.

The chuck is secured to the verticle side of the shaper table by four ¾-in. x 4-in. bolts, the heads of which fit into the T-slots. The brass is held between the two 9-in. x 9-in. plates which are drawn tightly together by the 2-in. nut, running on the stud which is secured to the back plate. The lower portion of this back plate is made to fit the shaper on which the chuck is to be used, the ¾-in. x ¾-in. lip fitting into a T-slot next below the one used for the lower bolts. The 10-in. taper key is driven in under the rear clamping plate and along the seat shown. This key is then secured against loosening by the small keeper. The front clamping plate is provided with 12 tapped holes for ¼-in. set screws which assist in holding the brass between the plates. A ⅝-in. set screw in the 2-in. pin, or stud, provides a means for holding the brass in position while clamping. This set screw is run up against the lower side of the brass.

GANG TOOL FOR CUTTING PISTON PACKING RINGS.

Piston packing rings may be cut from the finished stock very rapidly with the tool shown in Fig. 19. The 2-in. square shank is held in the tool post in the usual manner. The body of the tool is made of steel, with a 1¼-in x 6¼-in. slot machined through it. There are five 1¼-in. x 6½-in. blocks, tapered from ¾-in. at the top to $\frac{23}{32}$-in. at the bottom, and two blocks, having this same taper on one side but being square

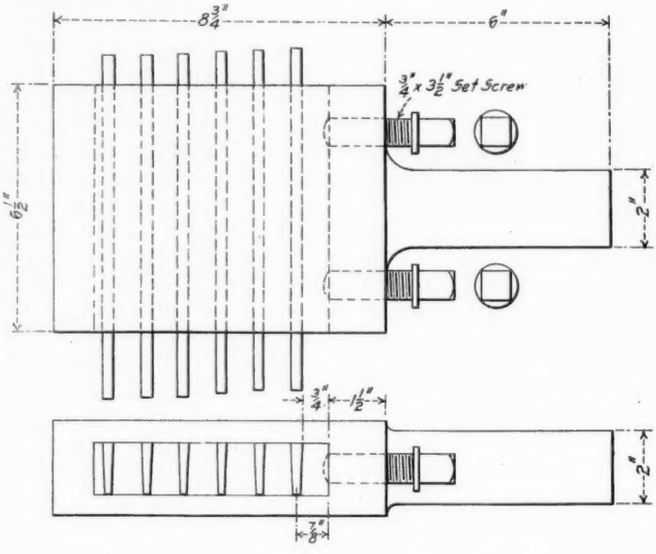


Fig. 19—Gang Tool for Cylinder Rings.

with the top and bottom on the other. These two latter blocks fit at the ends of the slot in the tool body, while the tapered ones lie on 1-in. centers along the slot. The five cutters, of high speed steel, are made 10 in. long with tapering slides to fit against the tapered filler blocks. The cutting tools and filler blocks are held in place by the two ¾-in. x 3½-in. set screws. Before tightening the set screws, the ends of the cutters should be adjusted at slightly varying distances from the work, that cutter farthest from the tool post being in advance of the others. This provides for the rings being cut off successively, working from the end of the stock.

FLAT DRILL CHUCK.

Flat drills, when used in drill presses or with air motors, are generally very unsatisfactorily held, usually with a set screw or even nothing but a square socket to take the rough forged shank. The chuck here shown, Fig. 20, consists of two main pieces and two semi-circular steel blocks which grip the round shank of the drill. In the drawing, the top view of these steel blocks shows also the relative position of the flat portion of the drill, the round not being shown. These blocks fit into the head of the chuck and are held from falling, in case the lower cap be removed, by a ½-in. dowel pin. After placing the round shank into the chuck and forc-

ing it up between the steel blocks, the lower cap is then screwed up and the taper faces of the blocks, fitting against similar tapers in the cap and head of the chuck, cause the blocks to firmly clamp the shank of the drill.

Flat drill shanks from ¼-in. to ⅜-in. in diameter may be

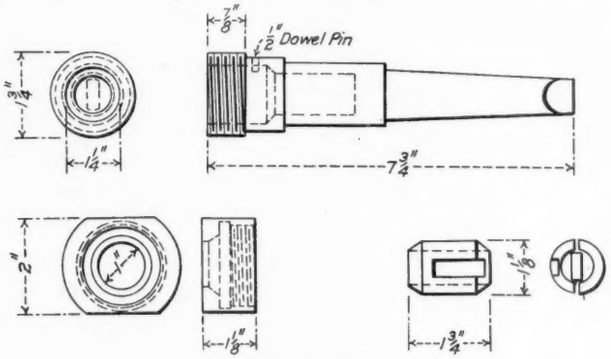


Fig. 20—Flat Drill Chuck.

used with a chuck of the dimensions here shown. The Morse taper shanks in this case is made to fit a No. 3 sleeve.

GAGE FOR LINING TWO-BAR GUIDES.

The lower bar of two-bar guides is usually lined up with the aid of inside calipers. It is necessary, in this instance, however, to use a square or straight-edge in truing the guide bar in the lateral direction, and it also very often happens that a mechanic's calipers change from being knocked upon the floor by other men who may be working in the vicinity of the guides.

The gage here shown, Fig. 21, was made especially for lining the lower bar. Being of brass, it is light, easily handled and easily made. The upright may be fastened to the base in any convenient way. The pointer is arranged for adjustment

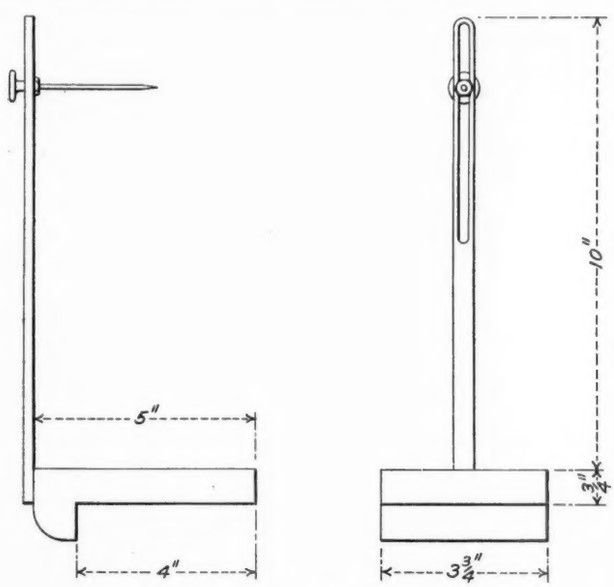


Fig. 21—Gage for Lining Two-Bar Guides.

in two directions by sliding in the slot of the upright and moving horizontally through the thumb screw and lock nut shown. The height of the pointer is set at ¾-in. less than half the distance between crosshead bearing surfaces, this ¾-in. being the thickness of the base. The shoulder guides the gage along the bar and the pointer is set out to the line through the cylinder.

TOOL FOR SCRIBING CIRCLES ON DRIVING AXLES.

There is an advantage in having, of a standard size, the circles which are scribed on the ends of driving axles, from which the prick punch marks are made when tramming the wheels for the side rods. These circles are usually cut in new axles on the lathe, but they become partly obliterated after the axle has been in service for some time. The tool illustrated, Fig. 22, is used for truing up an old circle or for making one in an axle which has not been previously cut on

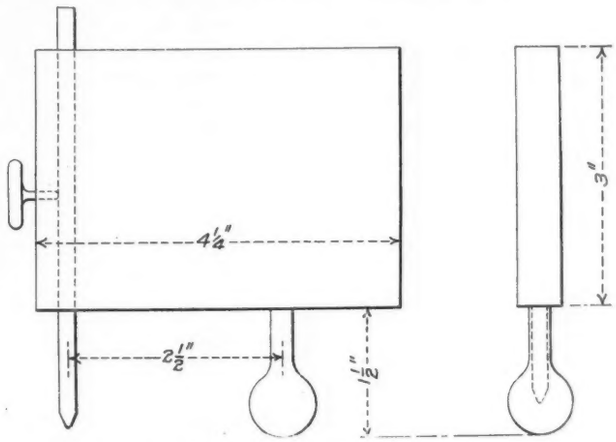


Fig. 22—Tool for Scribing Circles on Driving Axles.

the lathe. The body of the tool is made of wrought iron and the ball center and the scriber of steel. The ball is placed in the large center in the axle and the tool used as a pair of dividers.

TOOL FOR MAKING WEDGE POP MARKS.

In laying off shoes and wedges it is necessary to do a large amount of work with trams, straight-edges, parallel strips, etc. The shoe pop marks must be layed off with long, adjustable trams. The wedge pop marks, however, being layed off from their respective shoe pop marks, require only a short tram, and again, as these points do not affect the rod lengths, absolute accuracy is not necessary. The tool here illustrated, Fig. 23, is designed for this latter work.

The main part of the tool is made either of wrought iron

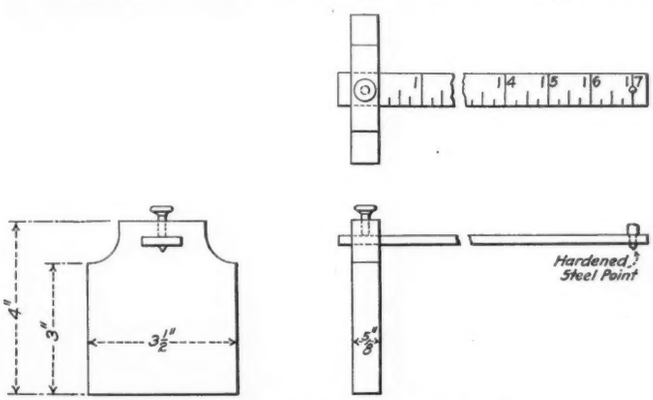


Fig. 23—Tool for Making Wedge Pop Marks.

or soft steel, though the latter is preferable, as there is less chance of its being affected by rough usage. The scale may be run through the head, as shown, or it may be clamped against the head with a stirrup bolt, the design shown, however, being preferable. For use the scale is set to the length desired and the head held against the shoe face, as in the plan view. By lightly tapping the hardened steel pointer the desired pop mark is made. This method is at once seen to be much quicker than using a small pair of trams to locate the point and then use a prick punch for making the pop mark.

The scale may be layed off to suit any conditions, and in both directions if desired.

This tool may also be used in a variety of cases as a depth gage or laying off frame holes, but it was designed especially for the purpose above described.

FLEXIBLE OLD MAN.

Probably one of the simplest substitutes for an old man in drilling holes in a boiler shell is the device shown herewith, Fig. 24. It is always a matter of difficulty, also, to place an old man for drilling, since very seldom it is that a suitable fastening can be obtained. This device consists merely of a metal plate and sufficient chain attached to it to extend around the boiler. After passing the chain around the boiler and allowing sufficient length for the air motor and drill,

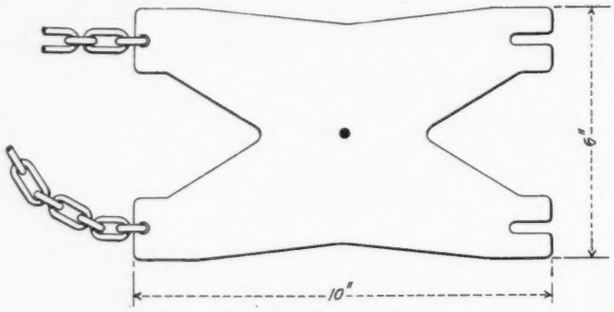


Fig. 24—Flexible Old Man.

links are slipped into the openings shown. The feed center of the motor operates against the center mark in the plate. This device is especially handy in roundhouse work, saving a large amount of time which is usually consumed in arranging for the ordinary old man. For the loss of a better name we have termed this tool a flexible old man, as it so effectively overcomes the many difficulties which are met in using the ordinary old man, due in great part to its limits as to flexibility and adjustment.

SPRING PULLER BLOCK.

There is probably more temper lost, especially in the roundhouse when the locomotive is fired up and due out, in connection with spring pulling, than with any other job on the locomotive. Various spring pullers have been devised, using chains or plates or a combination of both, but the block here shown, Fig. 25, is probably one of the most effective ones which can be devised. This block is used with two plates

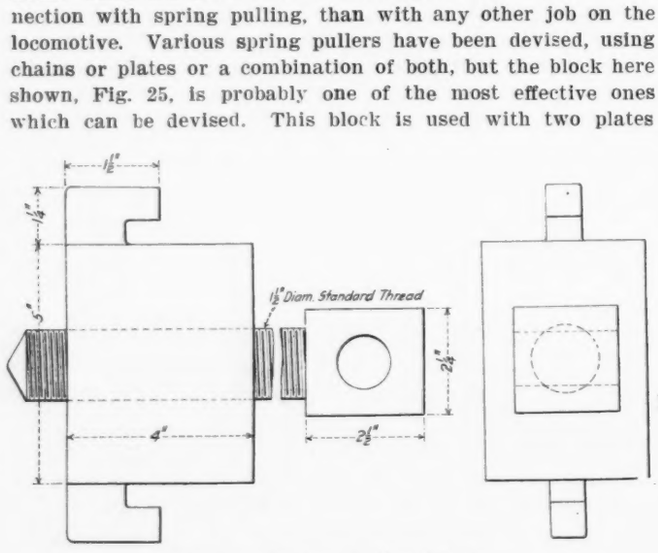


Fig. 25—Spring Puller Block.

which extend up to the top of the spring. A bolt is used across the spring and the hooks of the block are inserted in slots in the lower ends of the plates, which are sufficiently long to permit the screw working against the under side of the lower frame rail. This tool's lightness, simplicity and effectiveness are the points which particularly recommend it.

WRENCH FOR DRAWING STUDS.

The sketch herewith, Fig. 26, shows a very effective form of wrench for drawing studs. It is made of steel, the stirrup and the indicated portion of the bar being finished. The stirrup here shown will take studs up to 1¼ in. in diameter. The adjustment is rapid and the sketch shows the design to be that of a tool which is exceedingly useful.

END PLAY OR LATERAL MOTION GAGE.

The end play or allowance which is made for the lateral motion of locomotive drivers is usually measured with a stick and a rule. This method may be accurate, but it will bear close watching. It is almost compulsory that two men hold

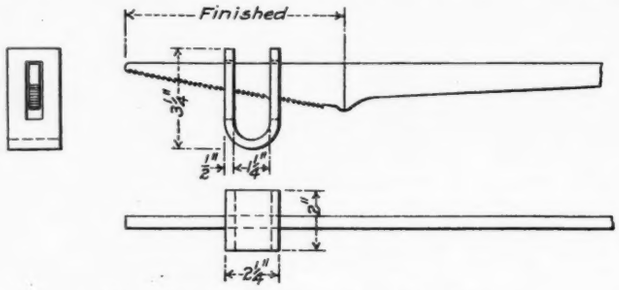


Fig. 26—Wrench for Drawing Studs.

the stick, one at either end, as it is necessary to hold a straight-edge against the outside of the frame on shoe on one side. The tool here shown, Fig. 27, is in reality merely a specially designed scale for making this measurement. The

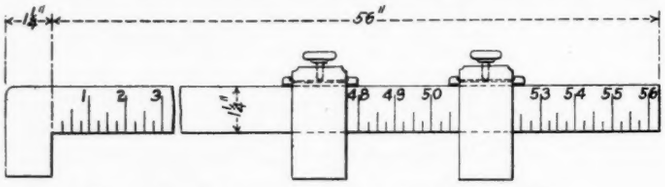


Fig. 27—End Play or Lateral Motion Gage.

square shoulder makes the second man with the straight-edge unnecessary.

The outside adjustable head is set to the distance between the hub plates. In case the finished shoe castings are in place, the gage, when held up with the inside of the square shoulder against the shoe casting, indicates the exact amount which must be taken up by two box flanges, plus the side play of lateral motion allowance. Two sliding heads are provided, as there are a variety of ways by which a man may get the desired lateral motion allowance.

CHILL FOR MOLDING ANCHOR PINS FOR CROWN BEARINGS.

Brass anchor pins, when turned, tapering, from stick brass, are expensive, and the process also requires the time of a mechanic and a machine when other work may need their time. If it is possible to mold these taper anchor pins in a

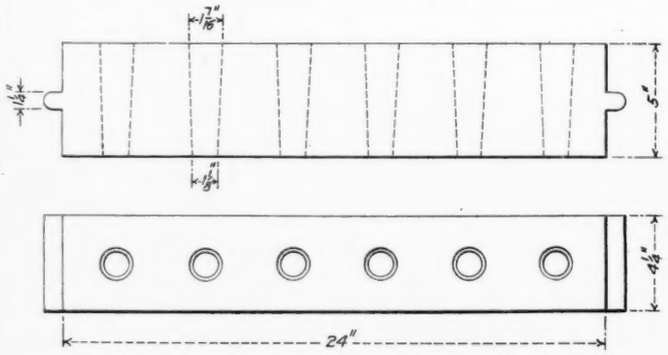


Fig. 28—Chill for Molding Anchor Pins for Crown Bearings.

metal chill and have them sufficiently true for use without machining, a considerable saving can be made.

The chill shown in the accompanying sketch, Fig. 28, was designed with this end in view, but as it has not yet been tried out, its value is not yet definitely known. There seems every reason, however, for saying that the method should be satisfactory.

The chill is to be made of cast iron, having six holes tapered down from 1 7/16 in. to 1⅛ in. in diameter. A polished

metal face plate is to be used with the chill, the larger end of the tapered holes being closed by the face plate. The metal is to be poured into the small ends. This precaution is taken so that if there be any piping in the metal during cooling, this piping, with the dirt which it may contain, will not be on the end which comes in contact with the journal.

PLANER STOP.

The usual practice in planer stops is to drive tapered plugs into the cast openings in the planer bed. This arrangement makes a good, steady stop, but the repeated driving in and drawing of the tapered plug results in knocking off the corners of the openings, making an unsightly planer bed.

The stop here shown in sketch, Fig. 29, may be made of

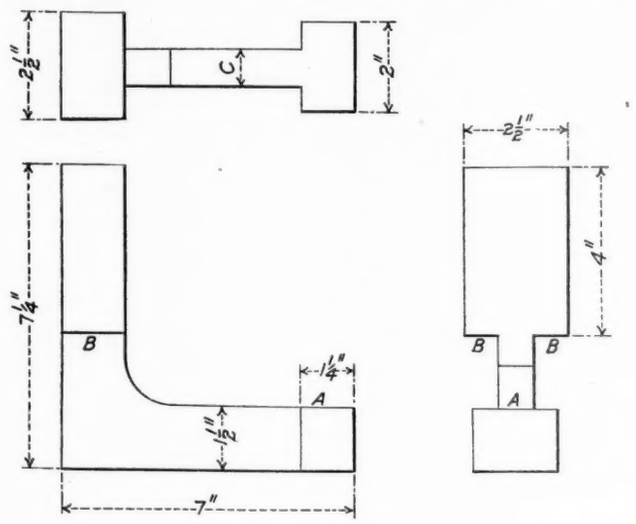


Fig. 29—Planer Stop.

cast or wrought iron. The side elevation shows the position which it assumes when being used. The surface A bears against the under side of the bed plate, while the shoulders at B rest on the top surface. The dimension C is made slightly less than that of the slots in the bed plate.

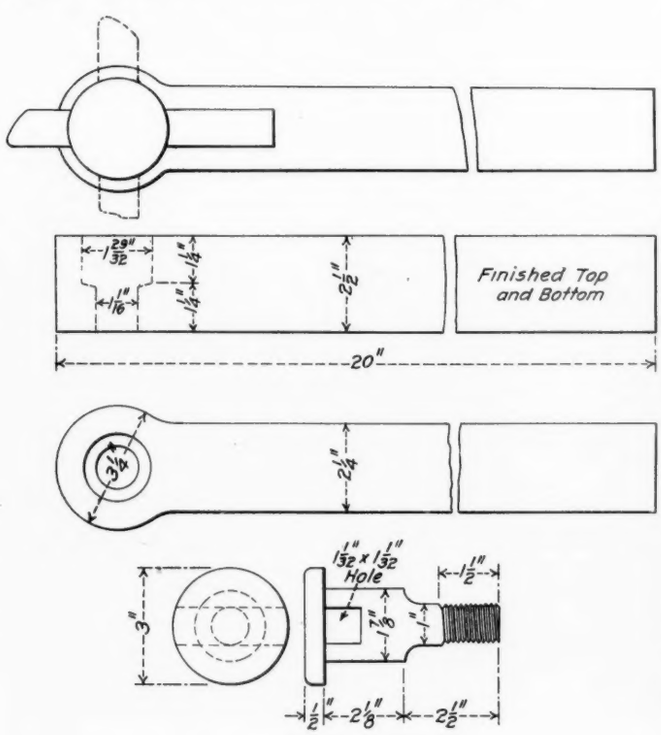


Fig. 30—Planer Tool Bar.

PLANER TOOL BAR.

The planer tool bar shown, Fig. 30, was designed to overcome the necessity of resetting, on the clapper plate, of a planer tool when readjusting in changing the direction of cut. It is also useful in permitting the use of small tool steel cutters.

The cutter is held in position by the bolt, through the head of which it passes. The cutter may be easily and quickly turned at any desired angle, which adjustment is much more easy and rapid than readjusting the entire tool at the clapper plate. The bar is finished on its top and bottom surfaces.

CYLINDER BUSHING CHUCK.

The line cut herewith, Fig. 31, shows one view of a cylinder bushing chuck which is easily and quickly adjusted in the bushing and one which grips the bushing firmly. The four dogs on each cone are first set for the bushing diameter and

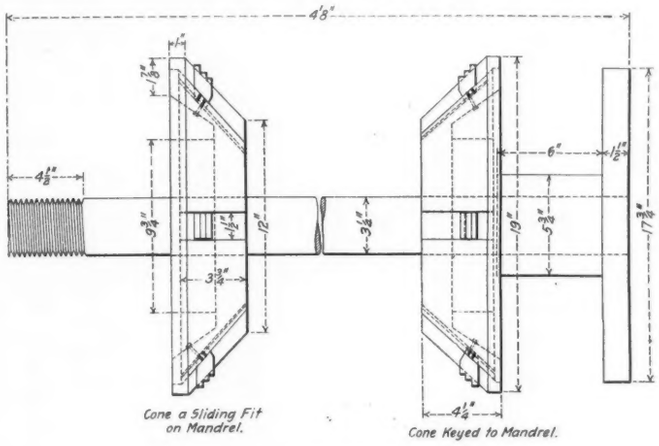


Fig. 31—Cylinder Bushing Chuck.

fixed in place by the tap bolts shown. One cone is keyed in place, while the other is a sliding fit and is clamped against the bushing by a large nut.

But two cuts are necessary in machining a bushing, the roughing cut removing about ¼-in. of metal all around. The finishing cut takes out any spring which may have resulted from the first cut.

AIR MOTOR HOLDER FOR VALVE-FACING MACHINE.

In setting up a rotary valve-facing machine the mechanic usually has no particular method for holding the air motor. A very common method is to rest the machine on a wooden strip extending up from the floor, and to prevent side motion by guying the feed screw handle with a couple of ropes. This

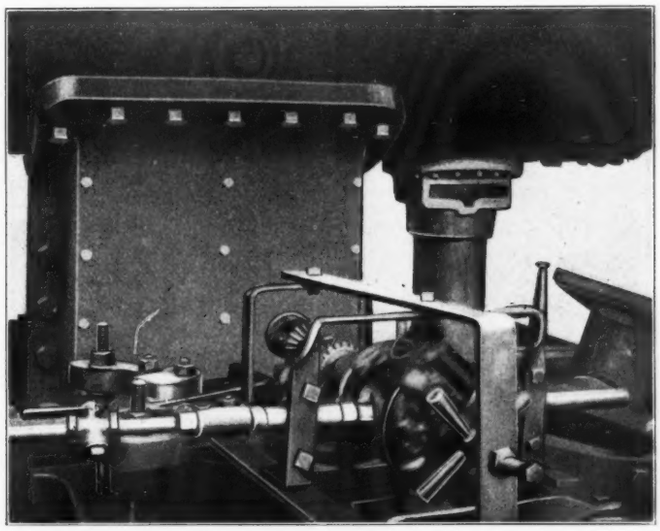


Fig. 32—Air Motor Holder for Valve Facing Machine.

method answers the purpose, but it consumes time arranging it.

The half-tone, Fig. 32, shows a holding device which is made of rough strips of iron shaped to the general outline of the air motor. It is secured in place by being bolted at the steam chest stud holes. Arrangement is also provided for a stop against which the feed screw bears.

This device is a time saver and is kept in the tool room, where it is gotten by check the same as any other tool.

SCREW JACK FOR PLACING AIR RESERVOIRS.

A well perfected shop kink is shown herewith in the drawing, Fig. 33, of a screw jack for raising locomotive air reservoirs into position. Close inspection reveals a large amount of necessarily accurate machine work, increasing the jack's first cost over one of simpler design, but the points of decided advantage which result would seem to offset the cost.

The jack is mounted on four cast-iron wheels, the forward pair of which are mounted on a swiveling axle. The radius of the wrought iron stirrup is 7 in., which provides for taking any sized reservoir in use. The 16-in. hand wheel rests upon 17 ball bearings, ⅞-in. in diameter. These balls run upon a ¼-in. thick steel liner, shaped to conform to the runway. The 2-in. diameter, vertical steel screw is single square threaded, ½-in. pitch, for about 3 ft. 5 in. of its length. The screw permits a maximum lift of 2 ft. 9½ in., which is an ample provision. The 1-in. diameter, horizontal steel screw is double square threaded, ½-in. pitch. This screw is used for side adjustment, so that it is easily possible to shift the reservoir horizontally to place the stirrup bolts.

The additional merit which the ball bearings give in elevating a reservoir is emphasized by the fact that the weight of the screw and its stirrup is sufficient to cause the hand wheel to revolve and the screw to descend. The collar plate, which holds the base flange of the hand wheel against the balls, is made in two halves.

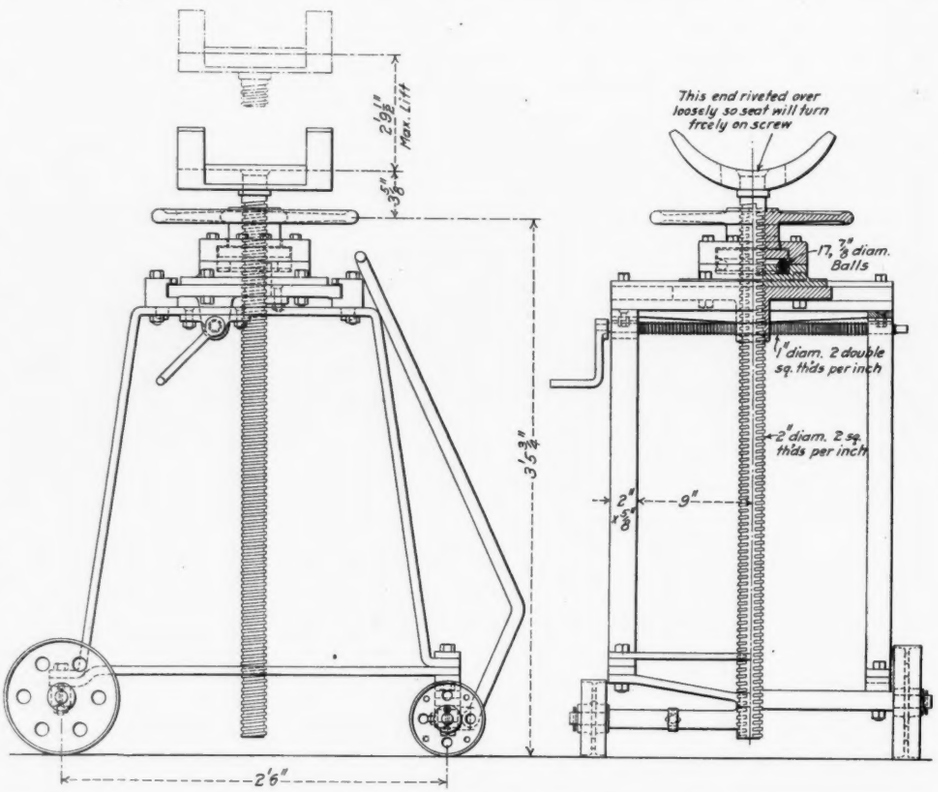

2'9½" Max. Lift
3'5¾"
2'6"
This end riveted over loosely so seat will turn freely on screw
17, ⅞" diam. Balls
1" diam. 2 double sq. thds per inch
2" diam. 2 sq. thds per inch
2"
9"

Fig. 33—Screw Jack for Placing Air Reservoirs.

CROWN BEARING CHUCK.

Crown bearings, or driving box brasses, may be machined to the press fit sizes in a lathe to better advantage than on a slotter. On a slotter it is necessary to allow the tool to pass completely around the bearing—or at any event, to make at least a few cuts on either end of the diameter of the brass—in order to caliper the size. When machining on a lathe, a few revolutions of the work suffice to give the desired measurement.

The chuck shown in the machine, as illustrated in Fig. 34, is the design used in turning brasses at Mt. Clare. The chuck has two cones, one of which is adjustable on the spindle. Besides being held by the cones, set screws are also driven into the brass. These chucks will take bearing for from 8-in. to 10-in. journals, the cones being well supplied with set-screw holes.

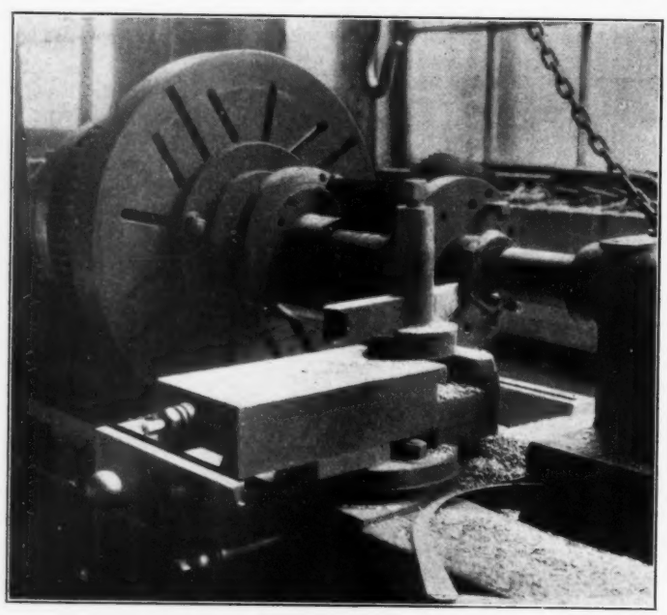


Fig. 34—Crown Bearing Chuck.

AIR PUMP CYLINDER HEAD CHUCK.

In the accompanying half-tone illustration, Fig. 35, is shown an air pump top cylinder head, chucked in position for boring out the bushing in the main valve chamber. It is a difficult thing to rebore these bushings without some special design of chuck and the one shown here is as simple, and still as effective, a one as could well be devised.

The chuck is made of cast iron and consists of two disks and two space pieces, all cast into one piece. One of the disks is threaded for screwing onto the face place, while the other disk is provided with bolt holes for securing the cylinder head by means of bolts through the valve chamber flanges. This arrangement assures perfect alinement of the bored bushing, as the joint surface forms the bearing against the plate of the chuck.

MACHINE FOR TRUING MAIN PISTON CYLINDERS OF TRIPLE VALVES.

The kink here shown in half-tone, Fig. 36, is rather extensive as such, but is classed as a kink, since the machine

is home made, and the idea is one which was worked out in machine shop No. 2 at Mt. Clare, where it is used. The casting is screwed onto a threaded boss of the horizontal face plate and is revolved by a belt which passes around a wheel inside the lower part of the machine. The small emory disk revolves in a direction opposite to that of the casting and is moved up and down through connection with the horizontal arm shown. As the amount of truing which is generally necessary is very slight, the emory disk is about ½-in. less in diameter than the cylinder and when in operation only a small portion of the disk is in contact with the bushing wall.

This machine leaves the cylinder walls in condition to be finished up when grinding in the packing rings.

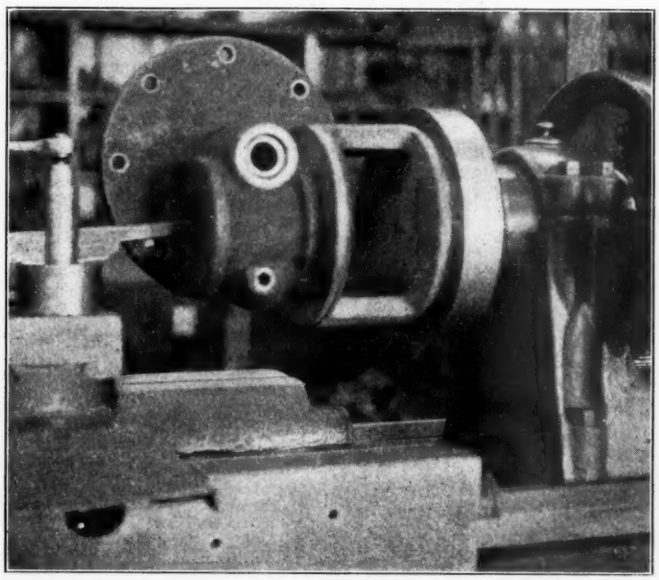


Fig. 35—Air Pump Cylinder Head Chuck.

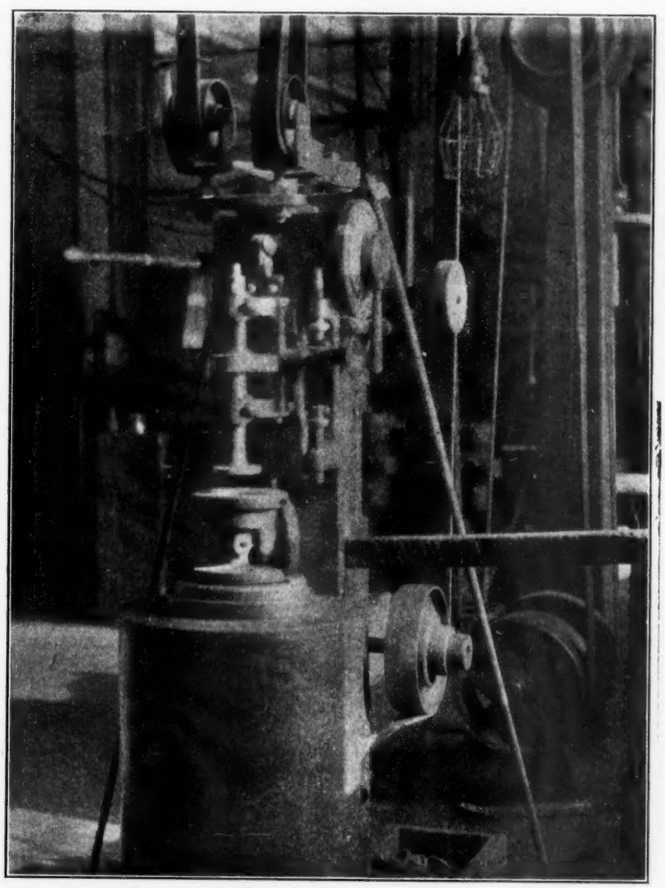


Fig. 36—Machine for Truing Main Piston Cylinders of Triple Valves.

MACHINE FOR GRINDING TRIPLE VALVE PISTON PACKING RINGS.

This machine is another rather extensive shop kink. It is used for grinding in the packing rings in the main piston of triple valves. It is made to operate on two sets of rings at a time and the design permits of this number being increased to any convenient number. The triple valve is held in the position shown and the end of the piston connects with a horizontal rod which is actuated in a reciprocating and a revolving motion simultaneously. This insures equal grinding all around, on both packing rings and cylinder walls.

All parts of the machine, Fig. 37, were made and assembled at Mt. Clare at little cost. The bed, or base plate, is an old wrought-iron steam chest cover.

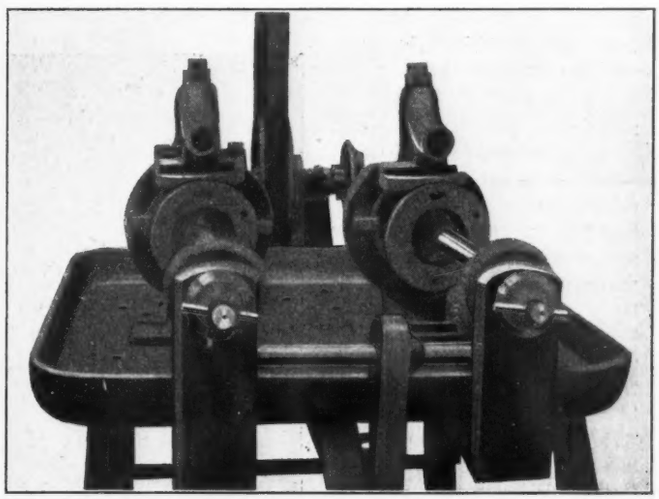


Fig. 37—Machine for Grinding Triple Valve Packing Rings.

METALLIC PISTON PACKING.

The designs of the metallic piston packing rings and vibrating cups for the greater number of the class E locomotives on the Baltimore & Ohio are shown in the accompanying line cut, Fig. 38. The point ring in the lower design is seen to rest in a brass ring which is made in halves and secured in place by dowel pins.

The vibrating cups are made 1/64-in. larger than the smallest diameter to which the rods of the particular class locomotive will be turned. When applying new cups, they are

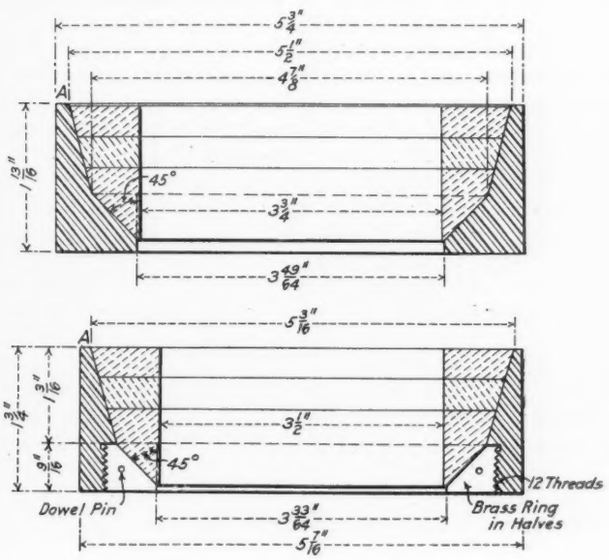


Fig. 38—Metallic Piston Packing.

bored out $\frac{1}{64}$-in. larger than the piston rod. When worn rods are turned down, a new cup and set of rings will be applied, and those removed are placed in stock for use on suitable sized rods. In some cases the cups are thickened to allow for rods of smallest diameter, in which cases the washer in the bottom of the stuffing box or the spring must be reduced to suit.

The babbitt rings, when made for stock, will be bored for the smallest diameter to which the piston rod of that class locomotive will be reduced. When applying in the shop the rings will be bored out to fit the piston.

These babbitt rings are cast separately in iron moulds or chills and are machined on a special expanding mandrel. Formerly these rings were cast in one piece and cut apart on a machine. The present method has reduced the cost of machining them by about 90 per cent. As high as 380 sets have been machined in a day and the average does not fall far short of this number.

BABBITTING DRIVING AND TRUCK BOXES.

For some time it was the custom at Mt. Clare to babbitt the hub faces of driving and truck boxes within the machine shop. No particular arrangement for leveling up the boxes was provided, so that a large amount of time was consumed in leveling up each individual box. This work is at present handled on a platform just outside the erecting shop. At the edge of the platform, between it and the wall of the shops, two rails are laid, about 10 in. apart, on a concrete foundation. The boxes are trucked from the shop to this platform and placed directly upon the parallel rails. No further leveling up is necessary. Engine truck boxes are handled in a similar way.

REPAIRING SHOE AND WEDGE FACES OF DRIVING BOXES.

The same parallel rails which are used in babbitting the hub faces of driving boxes are also used for pouring brass on their shoe and wedge wearing faces. The leveled rails provide for setting the boxes in position, and it is but necessary to provide the barriers at the ends of the box to retain the molten brass.

The brass, and babbitt also, is heated in a vertical, cylindrical, brick lined furnace, using oil. After the brass has cooled the boxes are taken to a planer for correcting the box size and then to a drill press, where the oil ways are cut. Three circular oil ways are cut on each face, the tool used being so set that these circular ways intersect at one point each. By this arrangement, the oil may pass from the top to the bottom of the box face, but by circular paths. The oil, therefore, does not run down the box face so rapidly as it would with verticle, or even with slanting, oil ways, and the circular ways prevent the formation of shoulders in the wearing faces of the shoe or wedge.

LOCATION OF CYLINDER HEAD BREAKING RING.

A shop kink does not necessarily imply the creating of a new tool or device for doing a piece of work, but the mere changing of a method to increase efficiency may well be considered a kink. The changing of the cylinder head breaking ring from the outside to the inside face is an instance of a kink which saved 33⅓ per cent. of the cost of machining a head from a new casting. With the breaking on the inside, one setting of the casting is saved and the ring, of course, serves the same purpose regardless of its position.

DARIUS MILLER.

Darius Miller, who until recently was first vice-president of the Chicago, Burlington & Quincy, in charge of traffic, and whose authority was extended over the operating department when Daniel Willard left the Burlington to become president of the Baltimore & Ohio, has now been elected president of the Burlington. Mr. Miller takes his place among the railway presidents who are traffic men, and this class includes such men as Finley of the Southern, Ripley of the Santa Fe and Winchell of the St. Louis & San Francisco. W. H. Newman also belonged to this class. The operating officer is a line officer and the traffic manager is a staff officer. For this reason the traffic manager is not so directly in the way of promotion to the presidency of a railway as is the operating officer. It is often said, therefore, that it requires more downright ability for a traffic manager to reach the top than it does for the officer in the other departments.

Darius Miller.

That great judge and developer of men, James J. Hill, took Mr. Miller from the Missouri, Kansas & Texas eleven and a half years ago and made him second vice-president of the Great Northern. It is well known that ever since that time Miller has had the confidence of Mr. Hill to an extraordinary degree. Mr. Miller is a great traffic manager, which means that he is a great business getter. He combines suavity with sagacity and unfailing tact. He is never in a hurry, and, like a highly developed piece of machinery, he accomplishes an astonishing amount of work without developing any friction. The Burlington has long had the distinction of being one of the best managed railways in the West, as well as one of the most prosperous ones. The election of Mr. Miller as its president probably indicates a general policy of bringing all the Hill roads into closer harmony.

Mr. Miller was born April 3, 1895, at Princeton, Ill. He began railway work in November, 1877, as a stenographer in the general freight office of the Michigan Central at Chicago. He was then consecutively clerk in the general freight office of the St. Louis, Iron Mountain & Southern; chief clerk to the general manager, and then general freight and ticket agent of the Memphis & Little Rock, now a part of the Chicago, Rock Island & Pacific. He left this road to become general freight and passenger agent and then traffic manager of the St. Louis, Arkansas & Texas, now a part of the St. Louis Southwestern. He was later traffic manager of the Queen &

Crescent, and then traffic manager of the Missouri, Kansas & Texas. He was elected vice-president of the latter road in September, 1886, and two years later was elected second vice-president of the Great Northern. In January, 1902, he was elected first vice-president of the Chicago, Burlington & Quincy, and his jurisdiction was extended over the Colorado & Southern in March, 1909, after the Burlington acquired control of this property from the Hawley interests.

NEW SHOPS OF CENTRAL OF GEORGIA AT MACON, GA.

[WITH AN INSET.]

During the past two years the Central of Georgia has been building new locomotive and car shops at Macon, Ga., and a portion of the plant is now completed. This railway has three shops, one at Columbus, one at Savannah and one at Macon, and in selecting a site for a new shop, Macon was regarded as the most central point and the best location. The work was commenced early in 1907 with authority to build the freight car department and power plant, which would not interfere with the old shops. These having been completed and put in operation in July, 1908, by using a portion of them for locomotive repairs, it was possible to tear down the old shop and commence the new locomotive shop. It was deemed advisable in every way to keep the shop location in the heart of the city, where favorable labor conditions obtained, rather than to go outside where perhaps more room could be had and a better arrangement of the different shops might have been made. It was decided also that it was not necessary to have any large amount of intercommunication between the freight car department and the locomotive department, and for these reasons the grading was allowed to take the natural contour, which left the car department about 9 ft. lower than the locomotive department, thus saving considerable money in preparing the site by eliminating considerable filling. The only connection between the two departments is a narrow gage industrial railway from the main shops, for forgings, bolts, etc., to be delivered to the car department. The new roundhouse, the engine terminal and the power house have been completed, the roundhouse being used for locomotive repairs, temporary shafting having been erected and tools from the old shop moved into it so as to vacate the old property.

The storehouse, office and working shop are completed; the blacksmith shop about half completed, and the foundation for the main, machine, erecting and boiler shops are about completed. All tools, cranes, structural steel, etc., have been purchased and are being delivered, and it is expected to complete the buildings early in the spring of 1910.

CAR DEPARTMENT.

In working out the general plan of this plant, a great deal of study was given to the handling of material in the most economical manner, in many plants this being the most expensive item on account of lack of facilities. The lumber is brought from the storage yard to the mill, and after passing through the mill, by a Hunt system of narrow gage railways is sent to either the heavy repair shop or the light repair yard. Wheels from the machine side of the freight car repair shop are handled in a similar manner on a special truck, to any car in either the light repair yard or the heavy repair shop. All scrap and second-hand material is assorted and handled by use of a magnet, under a 15-ton gantry crane outside the heavy repair shop. All material and scrap, as it is gathered up around the car yard, is brought to the assorting platform, where all good, second-hand material that can be

Storehouse of the Central of Georgia.

Car Shop, Showing Gantry Crane and Repair Tracks.

straightened up and used again is assorted and repaired, and put in proper bins. All bolts are also separated, and where possible are cut off and re-threaded to smaller sizes. All bar iron stock that is of sufficient length to be used for bolt stock is also assorted and put into another compartment. For better facilitating the handling of second-hand and scrap material, a motor driven alligator shear is located at the side of the assorting platform. At the present time there is being installed an Ajax scrap re-rolling roll, it being the intention to handle all heavy No. 1 wrought scrap for re-rolling, where it is of sufficient size to warrant such, using up old arch bars, draw-bar straps and other similar material, and working it down to the standard sizes most used.

The car shop building is of brick, with slow burning wooden roof. It is composed of two central bays, 45 ft. each, for heavy repair work, provision having been made, if found expedient later to put in traveling cranes in these two bays. On one side is a 60-ft. bay devoted to mill work, and on the other side, nearest the light repair yard, is a 40-ft. bay, in one end of which is an office and a tool and store room. All bolts and other small supplies of a like nature are carried in this special storeroom for the car department. The central part of this bay is occupied by such machine tools as are necessary for the car department, including the wheel department. The opposite end is occupied by a blacksmith shop, where foreign forgings are made for repair work, and also second-hand material straightened and put in shape, only a sufficient force of men being used at this class of work to handle the straightening of material and making of odd forgings that are not standard, all standard material being handled in the main boacksmith shop by forging machines.

Sawdust and shavings from the lumber mill are carried across the street by a fan system, and fed direct to one of the boilers in the power house. The building is well lighted in the daytime, the main bays having a saw-tooth roof with northern exposure. For winter, when the days are short and it is necessary to use artificial light, Nernst lamps will be used inside the shop and Magnetite lamps outside.

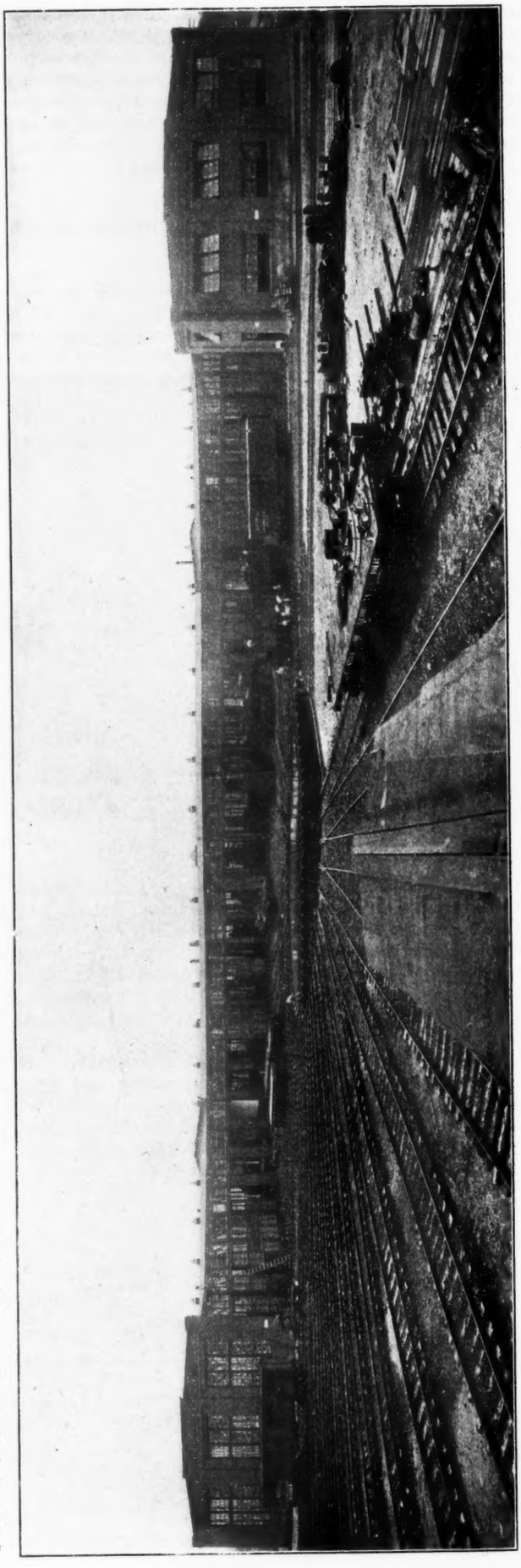
All employees of the car department enter through a lavatory and locker room, where the races are separated and time clocks are provided for checking in. On either side of the entrance lockers for storing clothes and platforms for storing tools have been arranged. On the extreme ends of the building lavatories are provided for each race. These are not connected with the locker rooms, and the locker rooms are only accessible to employees at such times as the shops are not in operation.

The main car shop is heated by exhaust steam radiators and fans for distributing hot air through an overhead pipe system. The fans are located in the second floor of small annexes, one on either side of the main shop, the lower floors of these annexes being utilized for lavatories and closets.

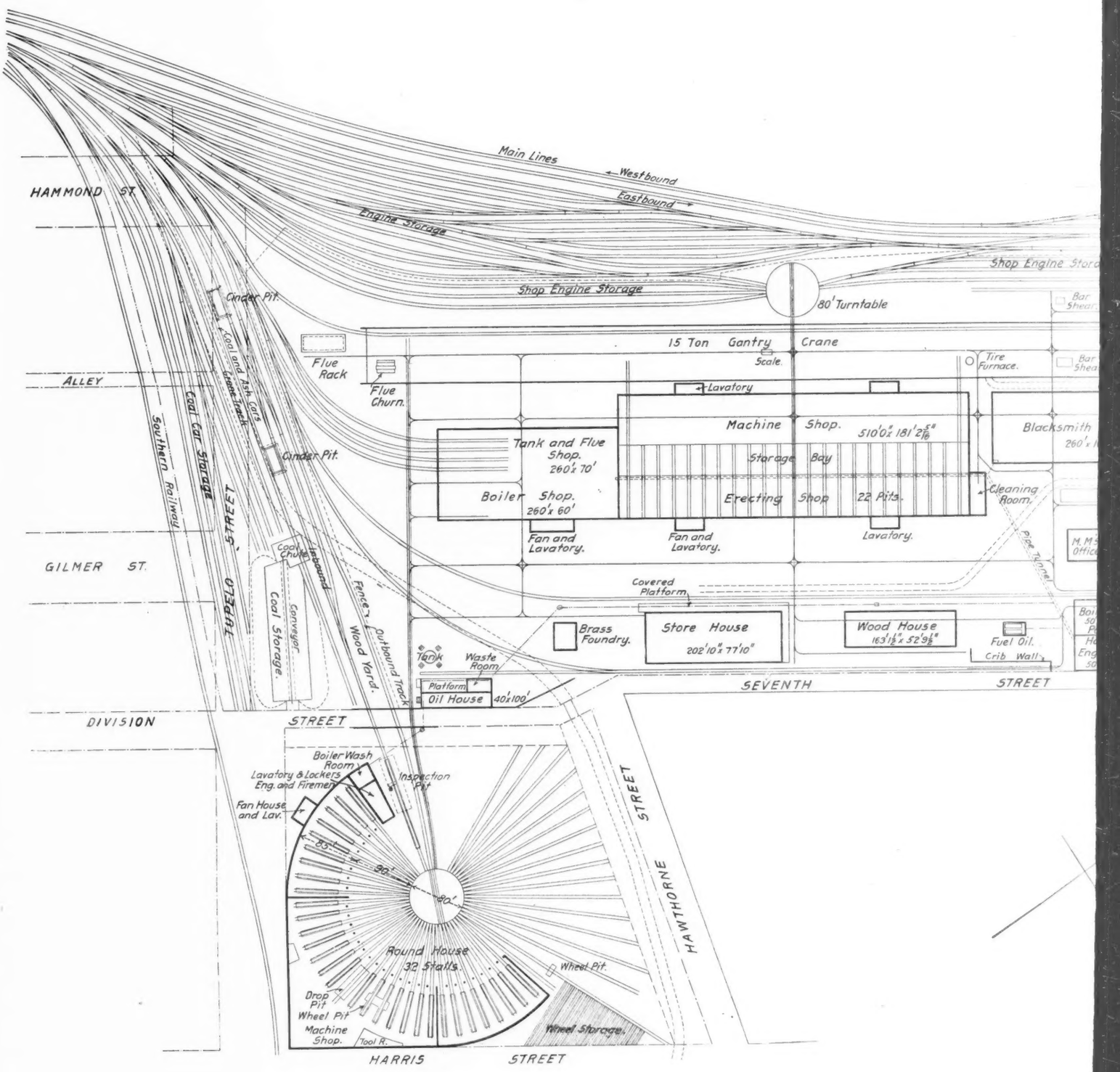
POWER PLANT.

The power house is of brick and steel construction. The grade of the property was taken advantage of, in this instance, so as to get a very high basement under the engine room, and and at the same time not have the floor undesirably high above the grade of the plant. The street is about 9 ft. below the grade of the locomotive department property, so that a high basement, with light on three sides, was obtained under the engine room.

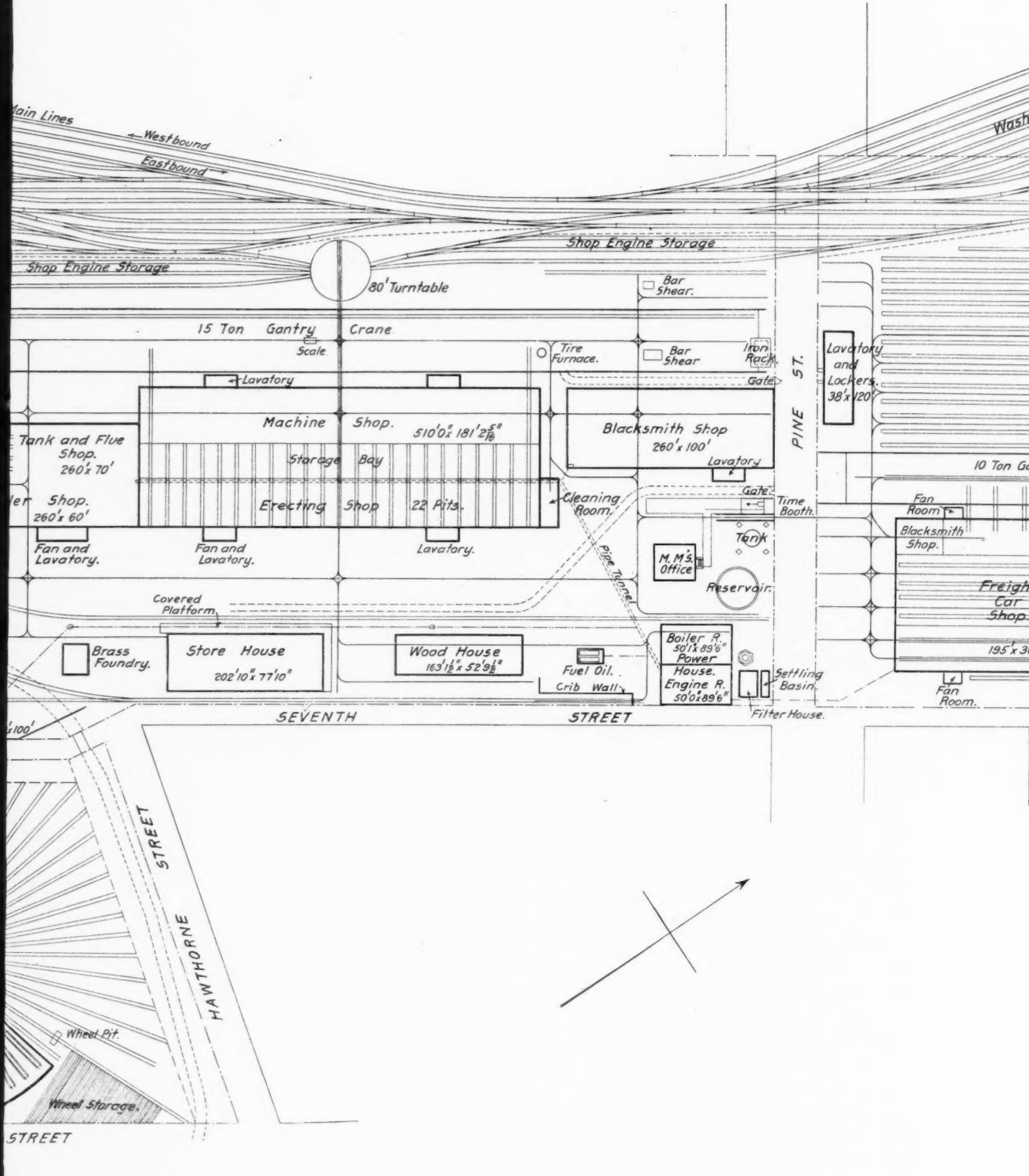
In the boiler room there are five 250-h.p. Stirling boilers, with an underground flue running to an outside stack 9 ft. in diameter and 175 ft. high. There is space reserved in the boiler room for two additional units, whenever the plant has grown to such a size as to require their use. Coal is delivered in front of the boilers by an elevated trestle, and ashes removed at the present time by a narrow gage railway running to standard ash cars and dumping outside the power house. Later, if the amount of power required makes it economical to install automatic stokers, provision has been made for the



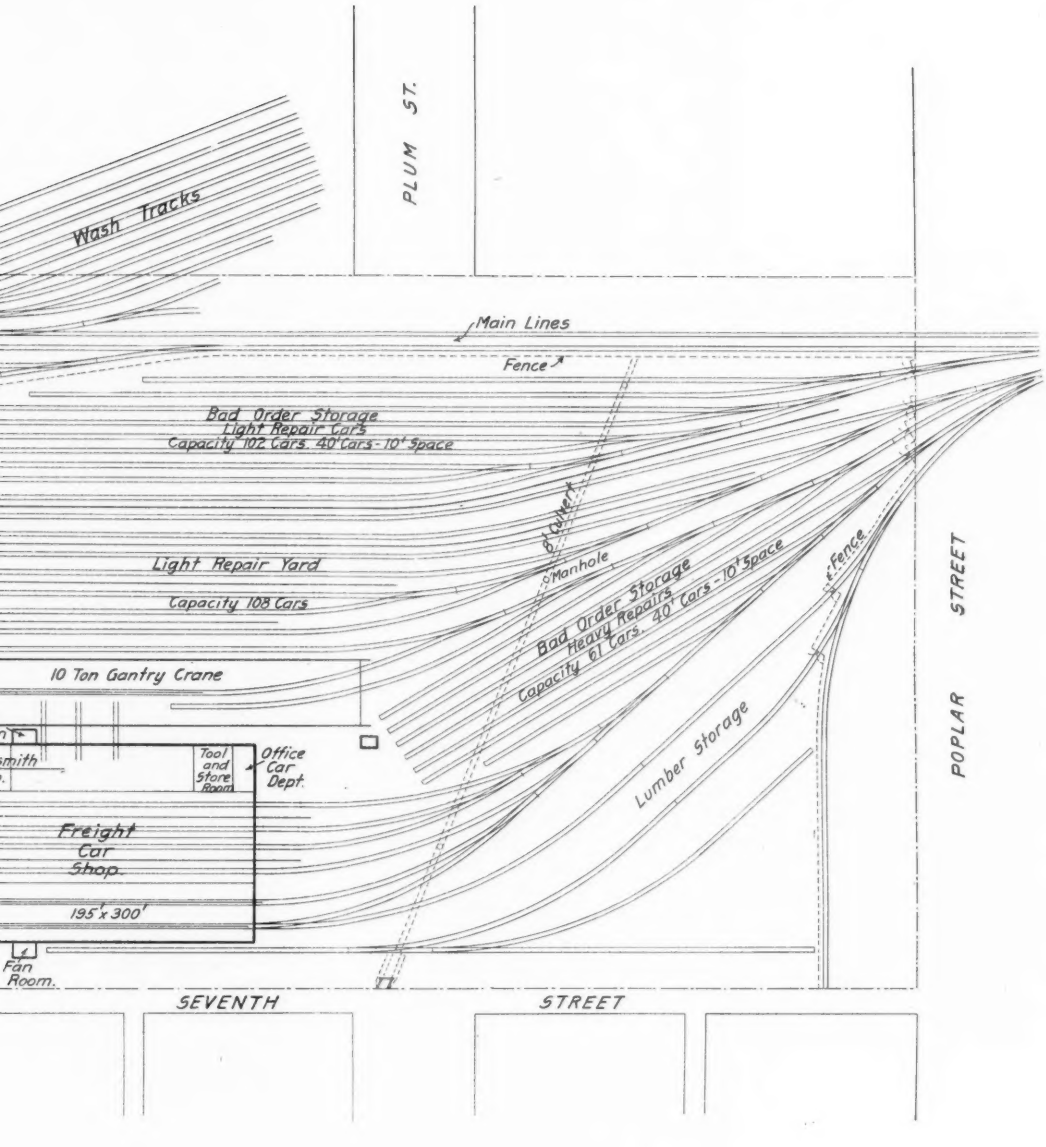
New Roundhouse of the Central of Georgia at Macon, Ga.

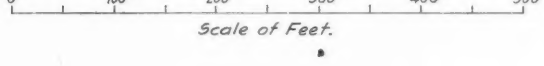


GENERAL LAYOUT OF BUILDINGS AND YARDS OF THE NEW SHOP



GENERAL LAYOUT OF BUILDINGS AND YARDS OF THE NEW SHOPS OF THE CENTRAL OF GEORGIA, AT





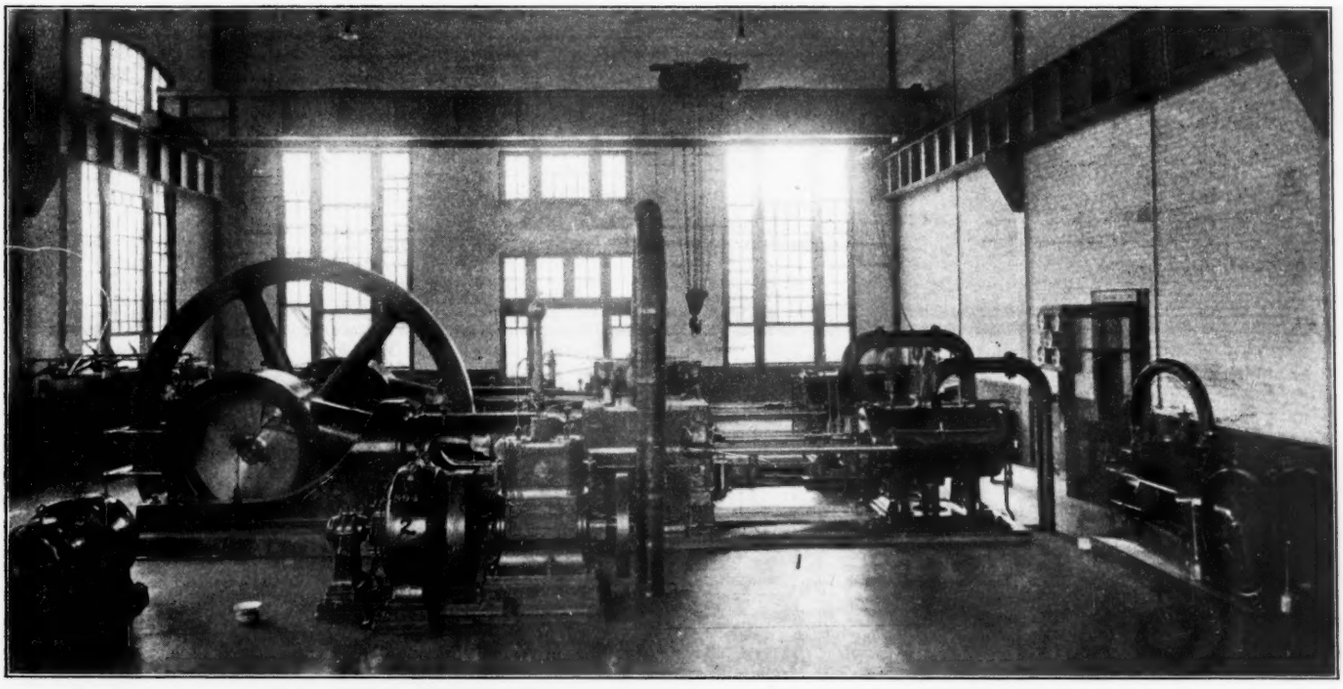
EORGIA, AT MACON, GA.

same ir the building itself, and a tunnel has been built under the floor in front of the boilers for the use of a conveyor. At the present time fully one-third of all power generated is furnished from shavings and scrap wood from the car department.

The municipal water supply, being the only water available near-by, was found to be too expensive for use in this plant, and the company therefore provided its own water supply by going about three-fourths of a mile along the right-of-way to the Ocmulgee river, at which point a concrete well was built on the bank of the river with the bottom 6 ft. below the lowest water. Three motor-driven pumps were installed in this well, pumping through a 16-in. line to a large reservoir situated just outside the power house. The pumps are operated and controlled entirely from a switchboard in the power house, and it is only necessary to go to the river occasionally for furnishing oil to the pumps and motors. From the reservoir circulating pumps take the water to the condensers on the tunnel running to the freight car repair shop. The line to the roundhouse is carried above ground on the fence at the property line.

Both the turbines and air compressor are arranged to run condensing, but are so piped up that in the winter-time, when it is desirable to have exhaust steam for heating, any or all of these units may be run non-condensing, and the exhaust steam used for heating purposes. The auxiliaries, such as vacuum pumps, circulating pumps, boiler feed pumps, filter pumps, etc., are steam driven and the exhaust carried to a feed water heater. All of the auxiliary units, with the exception of the vacuum pumps, are located in the basement, and the filter pumps in a filter house located just outside the main power house.

Fire protection has been provided for the plant; first, by a high service 50,000-gal. tank standing near the power house; second, by a 1,000-gal. Underwriters' pump in the basement



No. 1. 2,000-ft. Compressor.
No. 2. Engine Driven Exciter.
No. 3. Motor Generator Exciter.
No. 4. Oil and Vacuum Pump.

Engine Room; Central of Georgia Shops.

various units, and after being used as condensing water a certain amount is retained and treated with alum to settle the mud, run through a settling basin, and then through mechanical filters. This water is not only used for the make-up water for the power plant, but also for the locomotive supply of the entire terminal.

In the engine room the generating units consist of one 300-k.w. and one 500-k.w. Westinghouse turbines, direct connected to a.c. generators, with space reserved for an additional unit when required. There is an engine-driven exciter, also a motor-generator set, which is used as an exciter, it being the practice to start up the plant with the engine set and run it with the motor-generator set. A rotary converter furnishes 300 k.w. direct current for the day load, and a 100-k.w. motor-generator set direct current at night. In addition to lighting the shop property and shop buildings, this plant also lights the entire yards, warehouses and depot at this point. Besides the generating units in the engine room, there is also a 2,000-ft. Corliss cross-compound air compressor, built by the Chicago Pneumatic Tool Co., Chicago. The air is taken directly from the compressor through an after-cooler, and then through the power tunnel to the various buildings for distribution, the main tunnel running to the erecting shop, with auxiliary of the power house, and third, in case of emergency, the service pumps in the filter plant may be by-passed into the fire system.

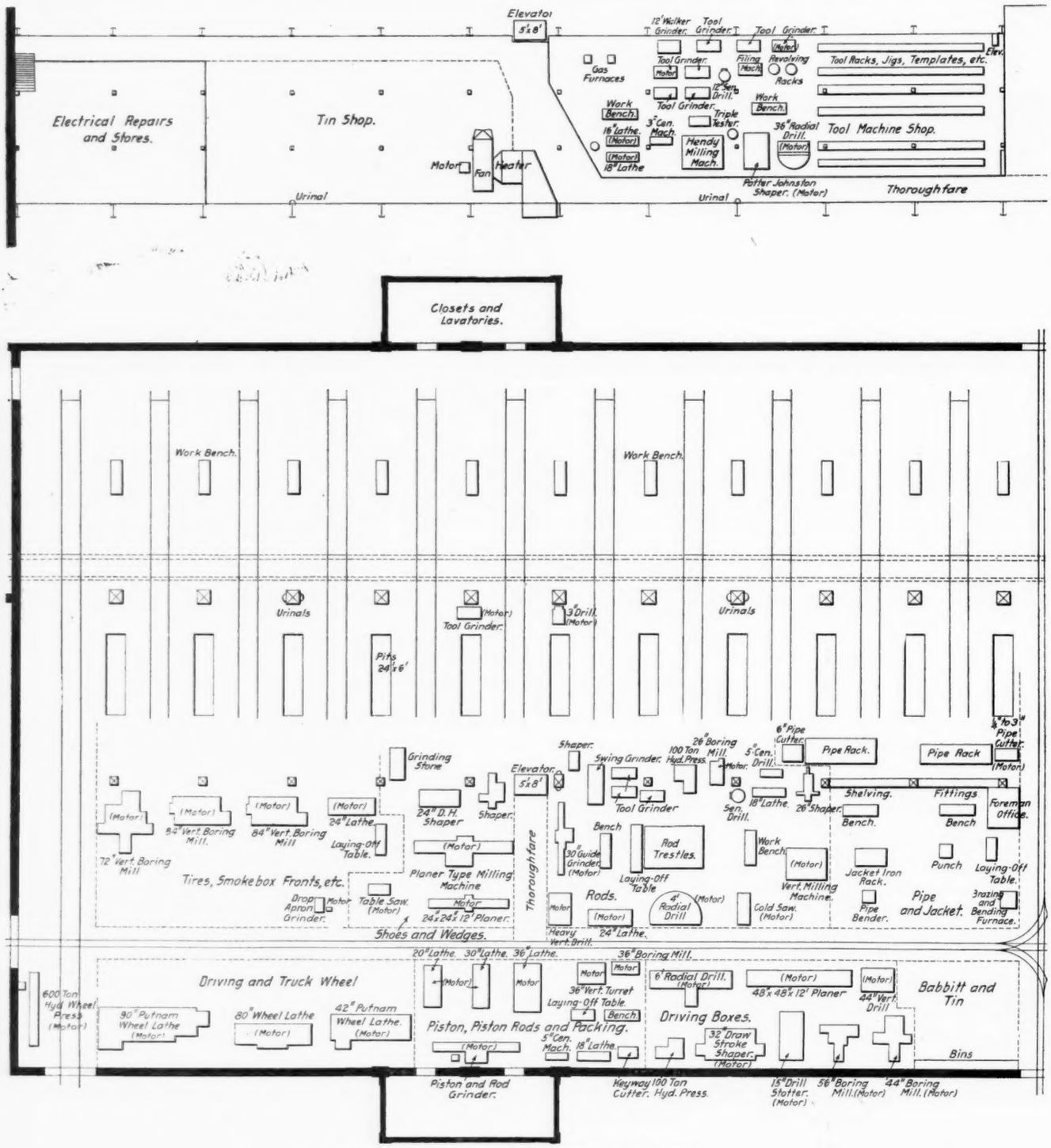
ROUNDHOUSE.

While apparently the location of the roundhouse is somewhat contrary to the generally pre-conceived idea that it must be in close touch with the main shop, there are good reasons why, in a fairly large plant, this should not be so, and why it is better, for a great many reasons, to keep the roundhouse somewhat separated from the main shop buildings. A different class of employees is worked in each department, and the running to and fro between the shop and roundhouse causes a great deal of lost time. While, to a certain extent, the location was forced by the property lines, yet this is a very satisfactory solution of the problem, as provision has been made, by carrying out the outside walls at two points tangent, to form a rectangle, the corner of which is utilized as a machine shop for the roundhouse. In this there are all the tools necessary for the handling of roundhouse work, with a blacksmith forge in addition, so that there is little or no necessity for carrying work to and from the main shop, except heavy forgings occasionally. All standard material can be brought from the storehouse by narrow gage railway, and delivered at the machine shop in the roundhouse. In addition

to the machine shop, there is a motor-driven drop table, upon which all the drivers of an engine may be dropped at one time, or as many as require dropping. An electric monorail hoist has been provided for moving to and from the drop pit and wheel lathe in the machine shop such wheels as may require truing of journals. In addition to the drop pit, two other tracks are equipped with wheel pits for handling single wheels, while outside is a small pit for handling tender wheels.

There are 32 stalls in the roundhouse, making little over half a circle. The full circle has not been built, because first, it is thought that possibly future developments might require longer stalls than in the existing house and, second, it is not the intention to use the house for storing engines in any way whatever. Engines will be brought in over the cinder pits, given coal and water, and then placed on an inspection pit. After inspection, if no work is found necessary on the engines, they will be turned and at once run out on storage tracks which have been provided for this purpose. Only such engines will be taken into the roundhouse as require either boiler washing or repairs.

Beyond the roundhouse proper, and occupying about the area of one stall, a room has been provided for a locker room and lavatory for the engineers and firemen; also the back end of this annex being used for the hot water boiler washing system, with its reservoirs, pumps, etc. The first one-third of the house itself it is proposed to use for boiler washing,

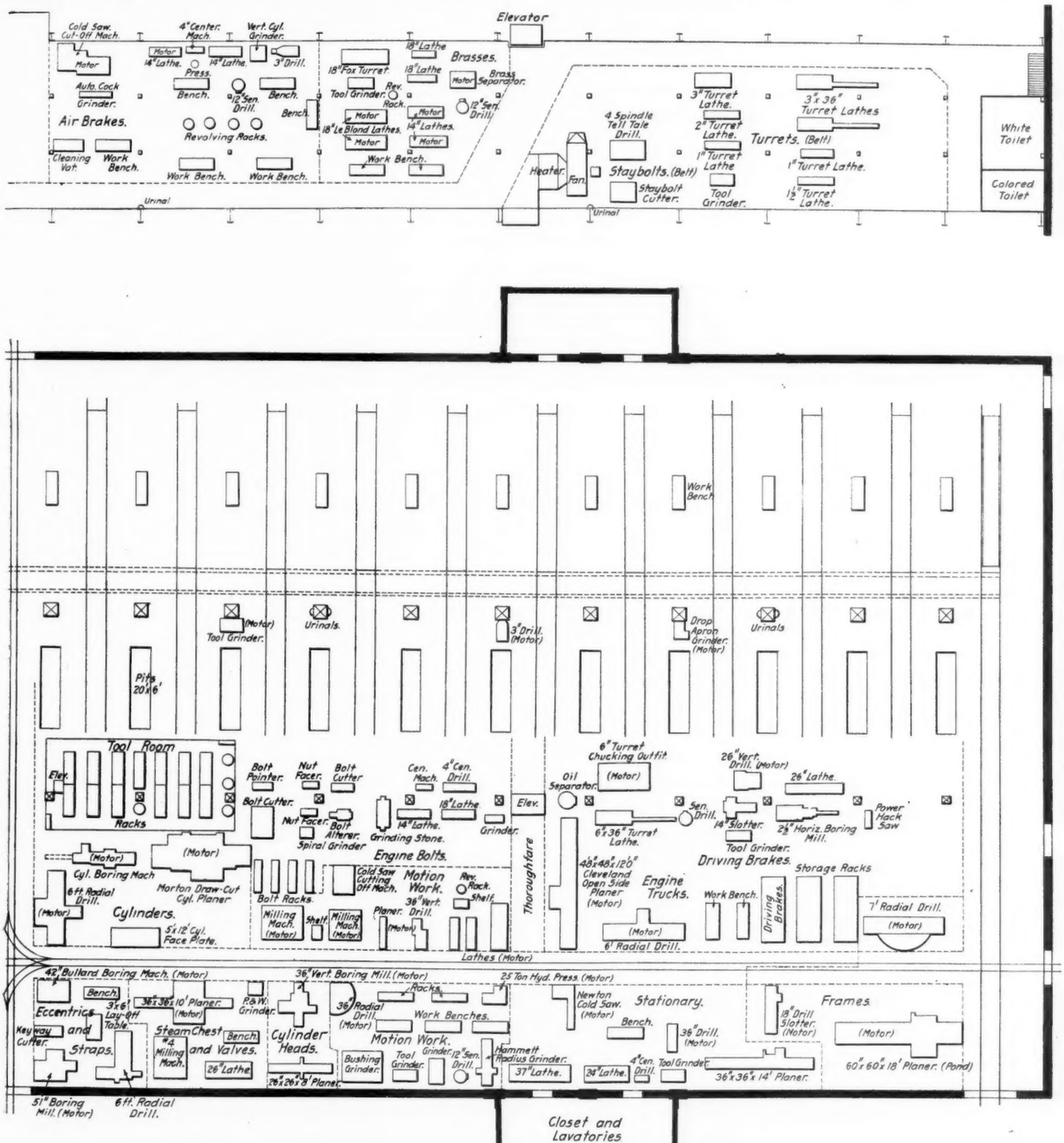


Machines not otherwise indicated, are belt-driven.

Plan and Tool Layout, South Half of Machine Shop.

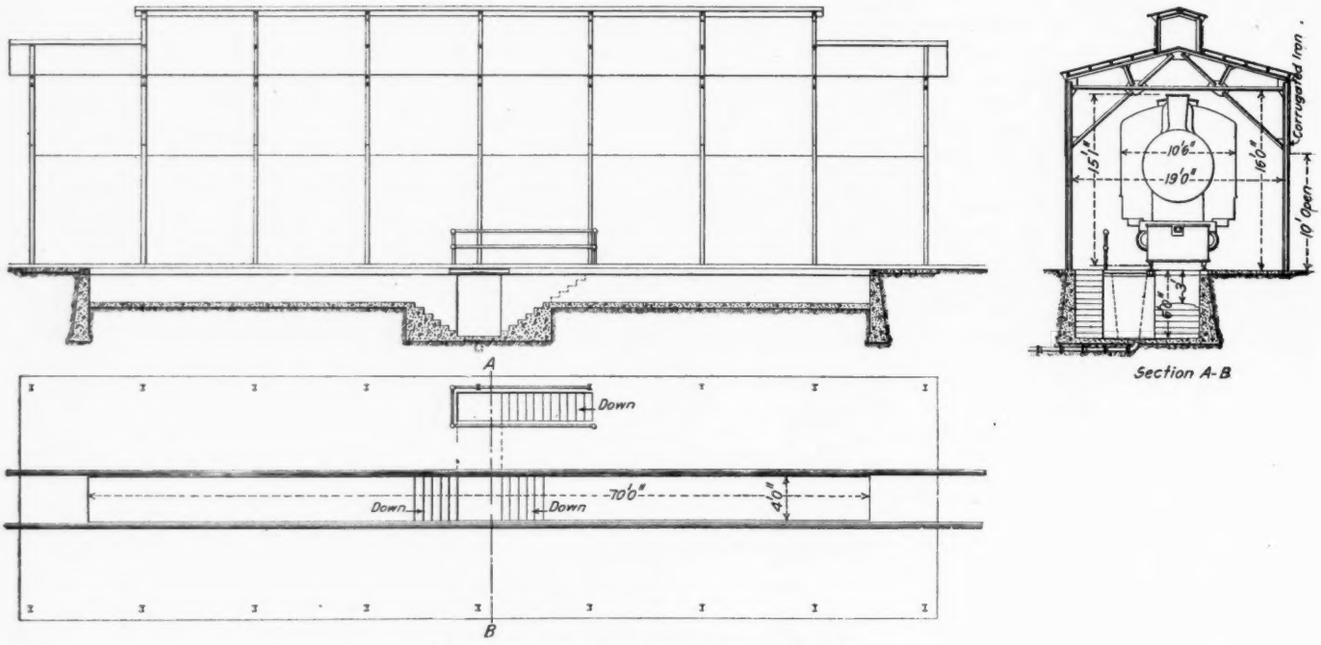
with plugs at every post for blowing out, filling and washing. The remainder of the house is equipped with drops at every other post for filling and blowing out. The pumps on the filling lines are motor-driven turbine pumps, and can be operated by a switch from any post on the round house. The roundhouse will be heated by exhaust steam from the power house, the fan being located on the second floor of a small annex. The hot air passes through a large duct running around the outer circle, to the various pits and the machine shop. The lower floor of the annex is utilized, as in other buildings, for closets and lavatories. Day lighting has been amply provided for by having the outer wall built unusually high and making it nearly all glass. Night lighting has been provided for by placing about 5 ft. above the floor, a vertical Cooper-Hewitt lamp for each pit. This throws the light on the running gear and outside parts of the engine, and makes a very pleasant light by which to work. Additional incandescent lights have been provided for by plugs at every post. There are also outlets on every post for two air hose attachments, and for steam for blowing up fires. Located at suitable intervals are receptacles for plugging in on the direct current line for a small variable speed motor mounted on a truck, which is used for driving the cylinder boring bar and valve setting machines.

There are two ash pits provided at the engine terminal, with cross-overs between, so that it is possible to get out any

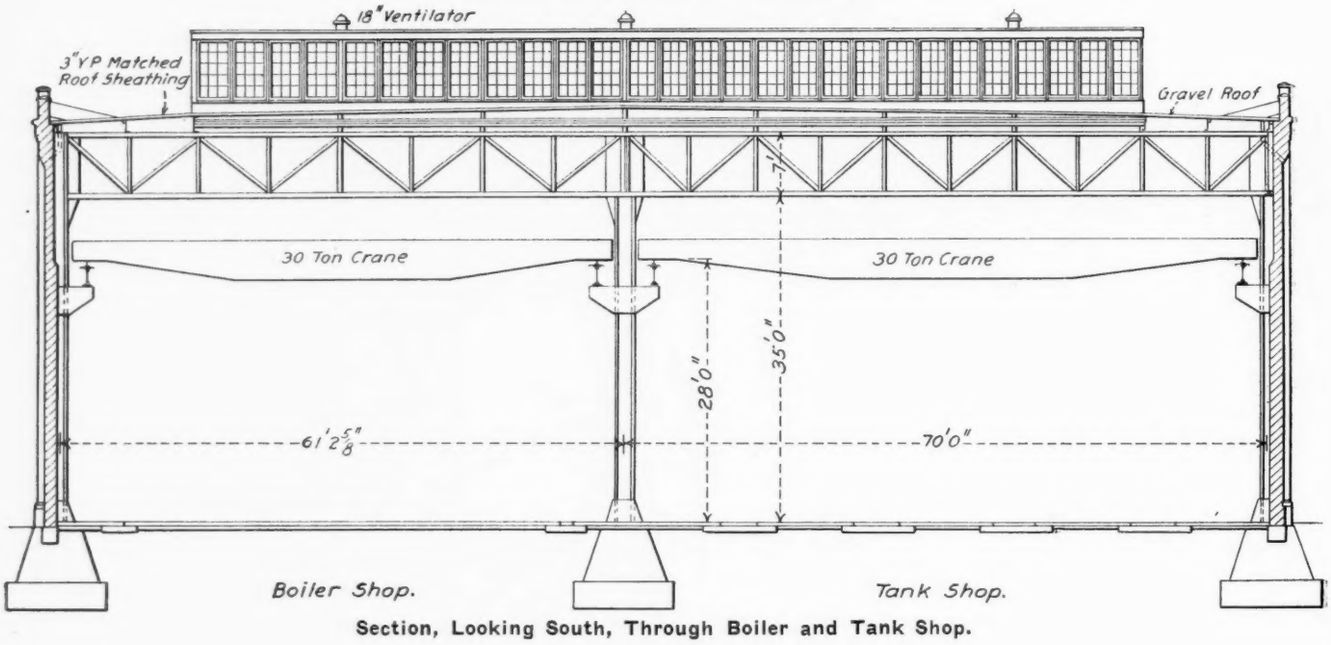


Machines not otherwise indicated, are belt-driven.

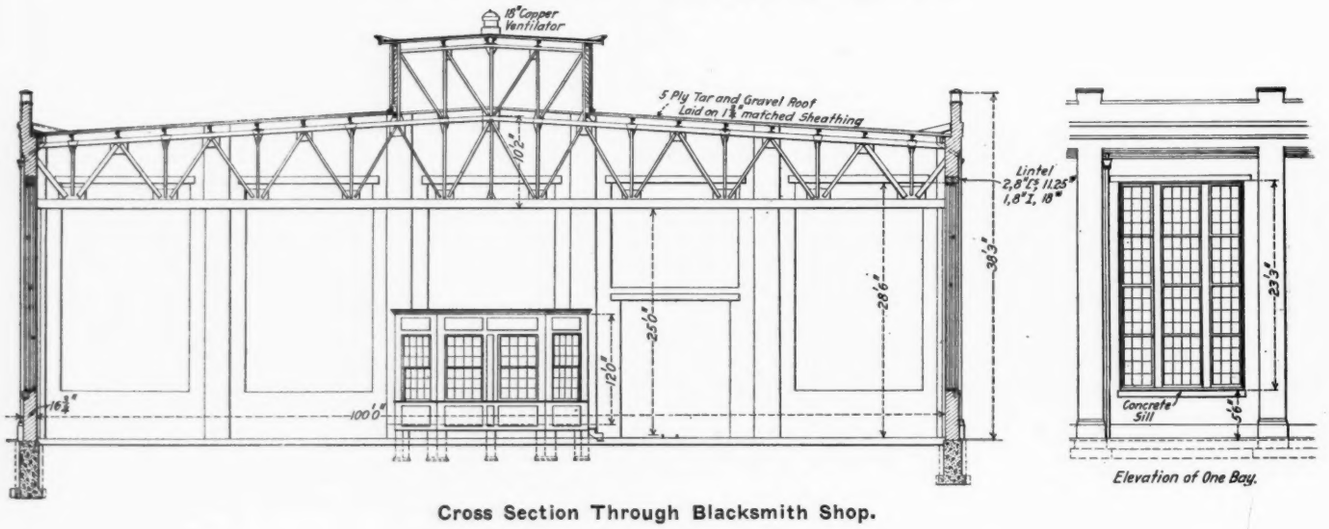
Plan and Tool Layout, North Half of Machine Shop.



Elevations and Sections of Inspection Pit.



Section, Looking South, Through Boiler and Tank Shop.

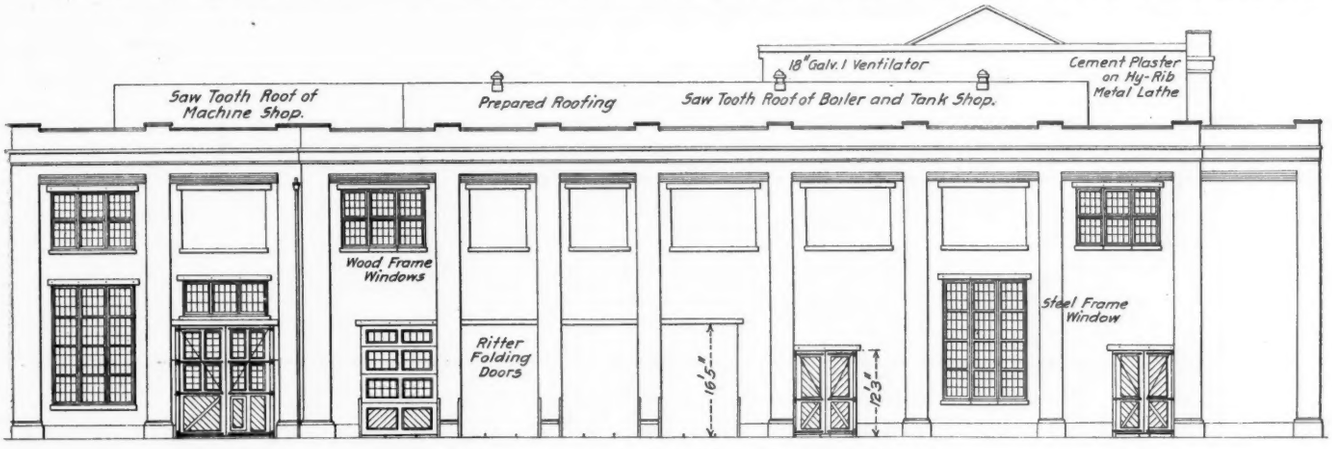


Cross Section Through Blacksmith Shop.

engine and give it attention out of its regular order when the occasion requires. The coaling station is a link belt storage arrangement which has been in use previously but is moved to a new location. Water cranes have been provided so that they will be available for both incoming and outbound engines, as well as engines leaving the storage tracks. Ashes from the cinder pits are to be handled by a locomotive crane with bucket; the crane will also be used for the shifting of coal to the chute and for other miscellaneous work around the plant.

The oil house is of brick and steel construction, with concrete roof and floors. It will be heated by exhaust steam from the power house. The delivery system is the Bowser self-measuring and indicating oil pump outfit. The oil from tank cars is delivered to the storage tanks through filling lines brought out to the track at the platform, and barreled oils are delivered to the tanks through filling holes in the platform.

The wood-working shop will be used for miscellaneous wood-work around a locomotive plant, such as repairing cabs, pilot beams, etc. It is of brick and steel construction, one story, with an industrial track leading to the shops.



South End Elevation of Boiler and Tank Shops.

LOCOMOTIVE SHOP.

The erecting shop contains 22 pits and one thoroughfare, on 22-ft. centers, with 13 ft. between center of outside tracks and wall, making the building 510 ft. long. This shop is 60 ft. wide. The storage bay, which runs between the erecting and machine shop, is 45 ft. wide, and the main machine shop is 70 ft. wide. The entire building is of brick and steel construction.

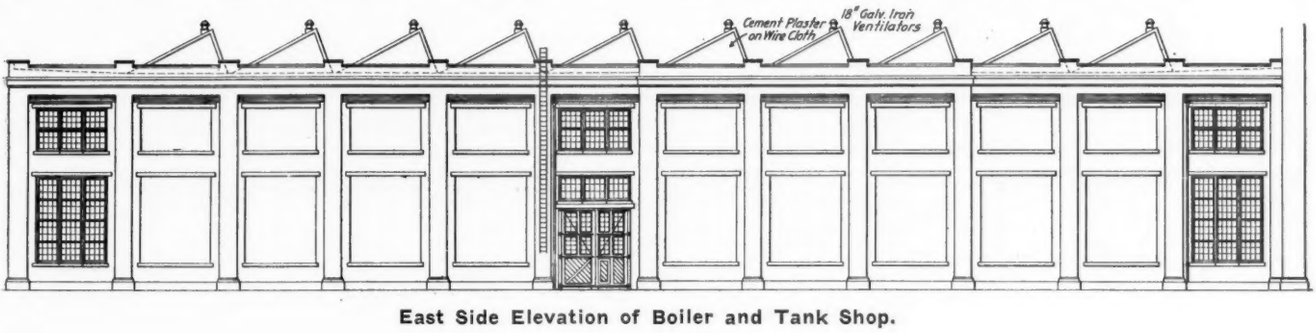
In the erecting bay there are two crane runways, the upper for a 125-ton crane and the lower for a 10-ton crane. The lower crane runway is continuous into the boiler shop and also into the small annex at the other end of the shop, which is to be used as a cleaning room. This arrangement allows the crane in the boiler shop to move into the erecting shop, pick up a boiler and take it into the boiler shop without any re-handling. All material stripped from the engines can be picked up by the 10-ton crane and taken to the cleaning room, cleaned, and returned either to the storage bay or machine shop, and to any other department if work is required. The entrance for engines into the erecting shop is by means of a turntable and a service track running through the middle of the shop.

The present arrangement is one-half of the future plant, provision having been made to double the whole plant when necessary, at which time the gantry crane material platform will be located between the storehouse and the present erecting shop. At present it has been considered advisable to keep the gantry crane platform near the machine shop.

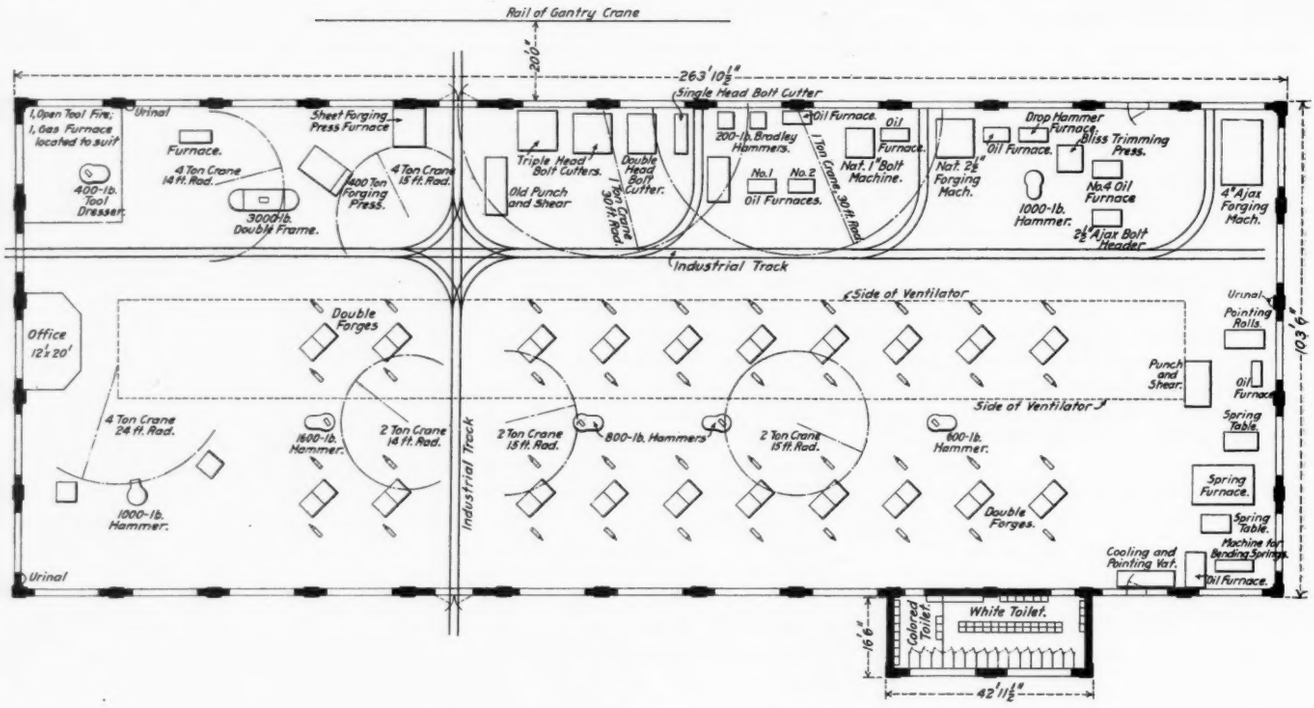
At the end of the pits in the erecting shop is a power tunnel from the power house, running through the entire bay. Provision has been made to provide connections for air, steam, oil and water, with suitable outlets at the pits for each.

Between the erecting shop and the main machine shop is a storage bay 45 ft. wide, with two floors, the lower floor being used for the storage of driving wheels and for fitting up driving boxes preparatory to wheeling an engine. This is served by two 7½-ton cranes operating on either side of the thoroughfare. Between each of the tracks is located a storage pit for the storing of material when stripping engines, until such time as it is required to assemble again. The upper floor of this bay will be used as a light machine shop bay, and will have a manufacturing tool room connected with the tool storeroom on the main floor of the machine shop by a small elevator. It will also have a department for electrical repairs, tin shop, air brake repair department, injector, lubricator and gage repair department.

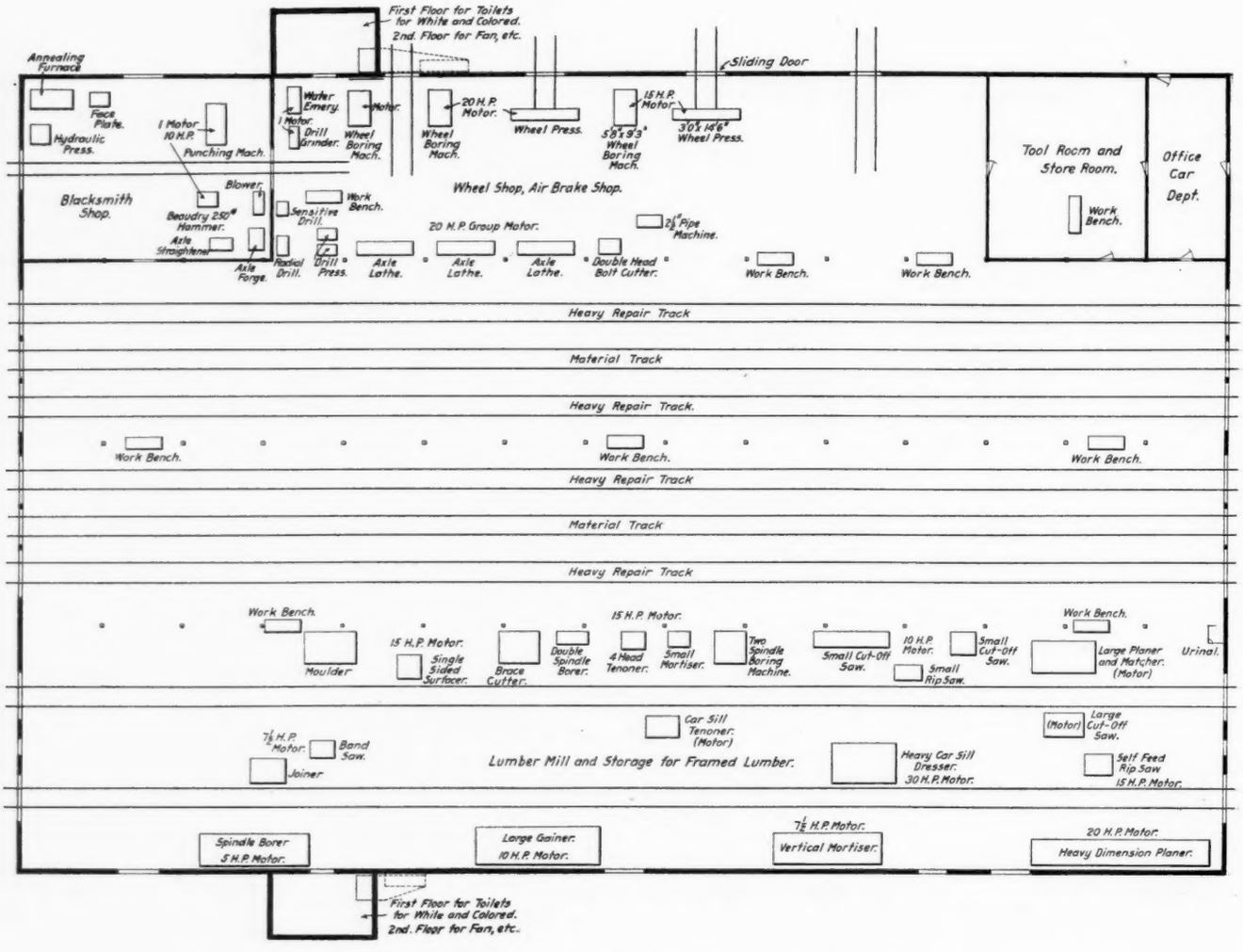
There will be two electric elevators for handling light material from the first floor to the second, heavy material being handled on a platform extending over the thoroughfare at the middle and served by the main machine shop crane. The machine shop is served with a 20-ton crane. There is a tool room for the storing and giving out of standard tools only, on the first floor. The general tool arrangement in the machine shop, as previously alluded to, has been with the idea of grouping rather by classes of work than by classes of tools, tools being



East Side Elevation of Boiler and Tank Shop.



Plan and Tool Layout, Blacksmith Shop.



Plan and Tool Layout; Freight Car Shop and Lumber Mill.

provided in each group for the class of work handled. This is to prevent, as much as possible, the re-handling of material from tool to tool.

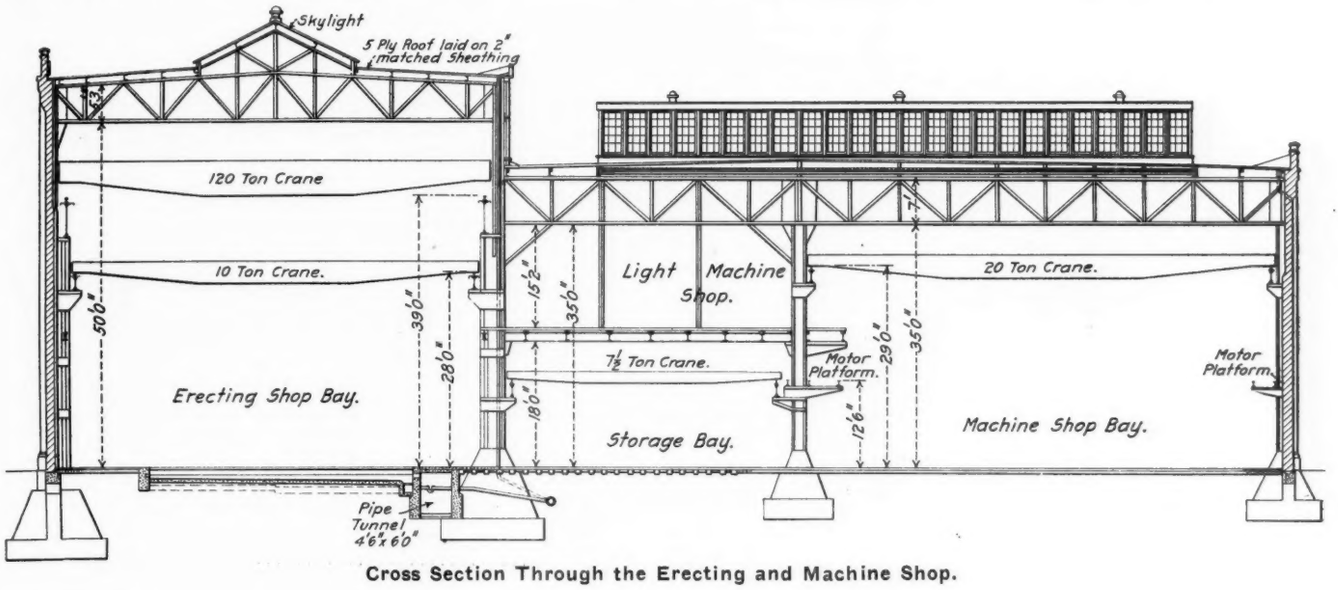
Both the erecting shop and the machine shop are heated by exhaust steam, the heater and blower arrangements being located on the second floor in the light machine tool bay. Small annexes are located on each side of the building for closets and lavatories.

BLACKSMITH SHOP.

This building is of steel and brick, 100 ft. wide and 260 ft. long. There is a small two-story annex at one side—the first floor being used for closets and lavatories and the second floor moved about on this truck and brought to the shear when required.

BOILER AND TANK SHOP.

The boiler and tank shop consists of two bays, 260 ft. long, the boiler erecting shop being 60 ft. wide and the other bay 70 ft. wide. The end nearest the erecting shop, in the 60-ft. bay, will be used for boiler repairs, while the other end will be used for flue work. In the 70-ft. bay the end nearest the erecting shop will be used for hanging, punching, shearing, etc., material for boiler and tank repair work. The opposite end of this bay will be used for tender and tank repairs. Both bays are served by 30-ton cranes. The one in the 60-ft. bay opposite



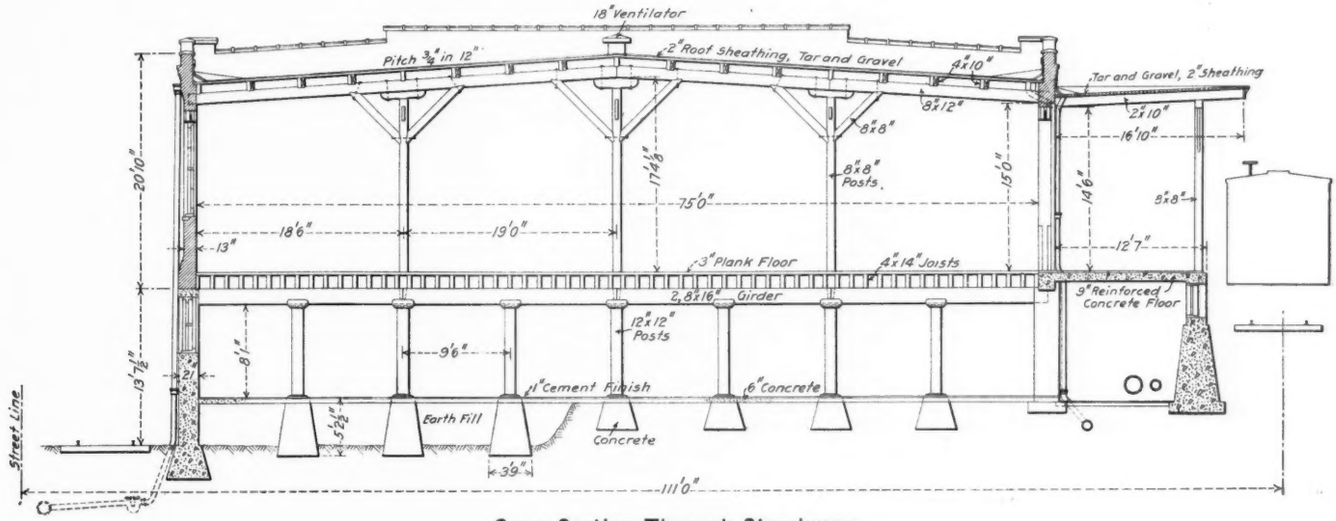
Cross Section Through the Erecting and Machine Shop.

for the housing of the volume and pressure blowers. No overhead cranes have been provided in this building, but a series of jib cranes at the heavy forges swing from the fires to a narrow gage railway which has been provided. Bar iron is stored in a rack and under the gantry crane, and a heavy guillotine shear is provided adjacent to the narrow gage railway for shearing heavy bars and billets. Round bar iron for standard bolt stock is stored beyond the gantry crane platform on a series of standard gage trucks located on an independent track. It is intended to handle directly from cars into the trucks and store the iron on the trucks, moving the trucks as the iron is required, opposite the small guillotine shear. This saves re-handling, and it will allow of any size iron being

the erecting shop has a continuous runway with the lower runway in the erecting shop. There will be a wall 10 ft. high separating the boiler shop from the erecting shop, the room above having been left for the crane running between the two departments.

MATERIAL PLATFORM.

A material platform, with a 15-ton gantry crane, including magnets for handling both scrap and plate, runs in front of the machine shop, boiler and blacksmith departments. All heavy material and supplies for these departments will be received and unloaded on this platform. All scrap will also be stored and handled by the crane on this platform. The tire furnace opposite the driving wheel group in the machine shop



Cross Section Through Storehouse.

will also be located here. At one extreme end of this platform the flue rattler has been located, the flue rattler itself being the old cylindrical type, but with provision made for automatically filling with flues when lifted into the cradle above the churn by the gantry crane; the flues, after cleaning, being delivered automatically to the lower cradle, where they can again be gathered up and handled by the crane.

Connecting all departments, as well as the roundhouse and storehouse, is a Hunt industrial narrow gage railway for the handling of material where crane service is not available.

All new tools purchased are motor driven, and the old tools that will be utilized will be placed in small groups and driven by an independent motor.

The general layout arrangement, size of buildings, etc., have been worked out by the motive power department of the road. The buildings have been designed by, and are being

Power House, High Pressure Tank and Office Building Under Construction.

erected under the supervision of the chief engineer. We are indebted to F. F. Gaines, superintendent of motive power, for the drawings, tool lists and this very complete description of the new plant.

MACHINE AND ERECTING SHOP EQUIPMENT.
GROUPED BY DEPARTMENTS.

CYLINDER HEADS AND CASINGS.

Planer, 26 in. x 26 in. x 8 ft.	Niles-Bement-Pond.	Belt.
Boring Mill, 36 in. vertical turret	Bullard	Motor.

STEAM CHESTS AND VALVES.

Lathe, 26 in.	Lodge & Davis	Belt.
Planer, 36 in. x 36 in. x 10 ft.	Niles-Bement-Pond.	Motor.
Miller, No. 4	Brown & Sharpe.	Belt.
Grinder, magnetic chuck	Pratt & Whitney.	Motor.

TIRES, WHEEL CENTERS, AXLES, SMOKEBOX FRONTS.

Wheel lathe, 80 in. quartering and journals	Niles-Bement-Pond.	Motor.
Boring mill, 84 in.	Niles-Bement-Pond.	Motor.
Boring mill, 84 in.	Niles-Bement-Pond.	Motor.
Tire lathe, 90 in.	Putnam	Motor.
Axle lathe, driving, 24 in.	Schumaker & Boye	Motor.
Boring mill, 72 in.	Niles-Bement-Pond.	Motor.
Wheel press, 600-ton	R. D. Wood	Motor.
Surface plate		
Lathe, 42 in. steel tired car wheel	Putnam	Motor.
Oil furnace, heating tires	Ferguson	Motor.
Keyseater, driving axle	Ryerson	Motor.

ROD WORK.

Shaper, 26 in., keys and liners	Morton	Belt.
Lathe, 24 in., rod brasses	Reed	Motor.
Lathe, 18 in. x 8 ft. crosshead pins	Le Blond	Belt.
Sensitive drill, 12 in.	Knecht	Belt.
Guide grinder, 30 in.	Bridgeport	Motor.
Shaper, 32 in., single head	Cincinnati	Belt.
Boring bill, 36 in., rod bushings	Bullard	Motor.
Grinder, No. 12 spiral groove, shear cut	Gardner	Belt.
Grinder, No. 6, spiral groove, shear cut	Gardner	Belt.
Hydraulic bushing press, 100-ton	Watson-Stillman	Belt.
Radial drill, 4 ft. 0 in., back geared	Niles-Bement-Pond.	Motor.
Vertical miller, 66 in, small table and crane	Niles-Bement-Pond.	Motor.
Swing frame grinder, No. 2	Springfield	Belt.
Floor grinder, No. 8D	Blount	Belt.
Cold saw, No. 16 Higley	Blount	Motor.
Vertical drill, 44 in. heavy	Foote-Burte	Motor.
Center drill, 5 in. stock	Packard	Belt.
Laying-off surface plate		
Two work-benches, standard, with Merritt 6-in. vises		

LINK WORK.

Link grinder	Hammett	Belt.
Universal grinder (bushings)	Brown & Sharpe	Belt.
Radius planer attachment	Underwood	
Crank planer, 16 in. x 24 in. x 40 in.	Niles-Bement-Pond.	Motor.
Lathe, 24 in. x 10 ft.	Reed	Motor.
2 lathes, 14 in. x 5 ft.	Reed	Motor.
Sensitive drill, 12 in.	Knecht	Belt.
Vertical drill, 36 in.	Foote-Burte	Motor.
Miller, 5-B, heavy plain	Le Blond	Motor.
Link grinder, heavy	Hamett	Belt.
Grinder, double spindle, horizontal attachment	Springfield	Belt.
Miller, No. 5 vertical	Ingersoll	Motor.
Bushing press, 25-ton hydraulic	R. D. Wood	Motor.
Cut-off saw, No. 16 Q. & C.	Higley	Motor.
Three work-benches, standard Merritt 6-in. vises		
Three shelves, 36 in. x 20 in.	New Britain.	
Radial drill, 3 ft.	Niles-Bement-Pond.	Motor.
4 Arbor presses, No. 3½	Bartlett.	

BRASS FOUNDRY.

Melting furnace, No. 360	Steele-Harvey.	
Ladle heater	Steele-Harvey.	
Pressure blower	Steele-Harvey	Motor.
Tumbling barrel and sieve cap	Globe M. & S.	Belt.

DRIVING BOXES.

Shaper, 32 in., special draw-stroke	Morton	Motor.
Bushing press, 100-ton	Watson-Stillman	Belt.
Vertical drill, 44 in. compound table	Foote-Burte	Motor.
Boring Mill, 56 in.	Bullard	Motor.
Slotter, 15 in. high speed movement	T. C. Dill	Motor.
Planer, 48 in. 48 in. x 12 ft., 4-head	Woodward & Powell	Motor.
Boring mill, 44 in., old car wheel with double chuck	Rogers	Belt.
Radial drill, double base, 6 ft. semi-radial	Bickford	Motor.

PIPE GROUP.

Pipe threader, 6 in.	Wieland.	
Pipe bender, pneumatic	Underwood	Air.
Pipe threader, 3 in.	Coxe	Motor.
Oil furnace, small brazing and bending	Ferguson	Oil.

BABBITT AND TIN WORK.

Furnace, heating metal	Tate-Jones	Oil.
Furnace, melting off and heating	Tate-Jones	Oil.

PISTONS, PISTON PACKING AND PISTON RODS.

Grinder, piston rod	Landis	Motor.
Vertical turret, 36 in.	Bullard	Motor.
Lathe, 18 in. x 5 ft.	Schumaker & Boye	Belt.
Vertical turret, 36 in.	Bullard	Motor.
Lathe, 36 in., to swing 23 in. over carriage	Niles-Bement-Pond.	Motor.
Lathe, 20 in. high speed reducing	Le Blond	Motor.
Center drill, 5 in. stock	O. L. Packard	Belt.
Keyway mortiser	Niles-Bement-Pond.	Belt.
Lathe, 30-in.	Le Blond	Motor.

STAYBOLT GROUP.

Bolt threader, 4 spindle	Lassiter	Belt.
Tell-tale drill, 4 spindle	Lassiter	Belt.

ENGINE BOLTS—DOWN STAIRS.

Lathe, 18 in.	Lodge & Shipley.	Belt.
Lathe, 14 in.	Lodge & Shipley.	Belt.
Center drill, small	Pratt & Whitney.	Belt.
Bolt pointer, 2 in.	National	Belt.
Bolt cutter, ½ in. x 3 in. triple head	National	Belt.
Grinder, No. 12 spiral groove	Gardner	Belt.
Nut facer, ⅝ to 1½ in.	Victor	Belt.
Nut facer, 1½ in. to 3 in.	Victor	Belt.
Bolt alterer	Foster	Belt.
Center drill, 2-spindle, 4 in.	Whiton	Belt.
Bolt machine, 4 spindle	Lassiter	Belt.
Grindstone	C. of Ga.	Belt.
3 shelves, 36 in. x 20 in.	New Britain.	
Grinder, double spindle, horizontal attachment	Springfield	Belt.

TURRET LATHE GROUP.

Flat turret, 2 in.	Jones & Lamson	Belt.
Flat turret, 3 in.	Jones & Lamson	Belt.
Flat turret, 3 in.	Pratt & Whitney.	Belt.
Heavy turret, 6 in.	Niles-Bement-Pond.	Belt.
Turret, chucking outfit, 6 in.	Steinlee	Motor.
Turret, set screws	Pratt & Whitney.	Belt.
Turret, 1 in. set screws	Pratt & Whitney.	Belt.
Turret, 1½ in., patch bolts	Pratt & Whitney.	Belt.
Turret, 3 in.	Warner & Swazley	Belt.
"D" grinder	Springfield	Belt.
8 shelves, 36 in. x 20 in.	New Britain.	

AIR-BRAKES—LUBRICATORS.

Steam gage tester	Crosby.	
Auto cock grinder, 8 spindle (For Car Shop)	Crosby	Belt.
2 triple rollers	Westinghouse	Hand.
2 triple racks (1 for car shop)	Westinghouse	Hand.
Vertical cylinder grinder	Saxon	Belt.
Sensitive drill, 12 in.	Knecht	Belt.

Lathe, 14 in., taper attachment	Le Blond	Motor.
Lathe, 14 in. taper attachment	Lodge & Shipley.	Belt.
Vertical drill, back geared	Foote-Burte	Belt.
Center drill, 2-spindle, 4 in. stock	Whiton	Belt.
Cut-off saw, No. 16	Q. & C.	Motor.
Test rack, air pumps	Westinghouse.	
Test rack, injectors	Westinghouse.	
Test rack lubricators	Westinghouse.	
Test rack, engineers' valves	Westinghouse.	
6 work benches, standard	C. of Ga.	
4 revolving racks, No. 172	New Britain.	
Cleaning vat	C. of Ga.	

DRIVING BRAKES.

Vertical drill, 36 in	Foote-Burte	Belt.
Lathe, 26 in	C. of Ga.	Belt.
Sensitive drill, 12 in	Knecht	Belt.
Floor grinder, D	Springfield	Belt.
1 work-bench, standard	C. of Ga.	

CYLINDERS.

Planer, special draw-stroke cylinder	Morton	Motor.
Drill, 6-ft. semi-radial	Bickford	Motor.
Cylinder boring machine, plain	Newton	Motor.

SHOES AND WEDGES.

Cold saw, No. 20, 36 in	Higley	Motor.
Shaper, 24 in. D. head	Cincinnati	Belt.
Miller, 36 in. x 36 in. x 12 ft. (Locate near rods)	Ingersoll	Motor.
Planer, high speed 24 in. x 24 in. x 12 ft.	Niles-Bement-Pond.	Motor.
Grindstone	C. of Ga.	Belt.

ENGINE TRUCKS.

Drill, 6-ft. semi-radial	Bickford	Motor.
Planer, 48 in. x 48 in. x 12 ft. open side	Cleveland	Motor.

BRASS WORK.

Turret lathe, 18 in. brass	Fox	Belt.
Turret lathe, 18 in. Fox, brass	Fox	Belt.
"D" grinder	Blount	Belt.
Lathe, 18 in. quick change gear	Le Blond	Motor.
Lathe. 18 in. quick change gear	Le Blond	Motor.
Brass separator, electro-magnetic	Gen'l Electric	Motor.
Lathe, 14 in. taper attachment	Niles-Bement-Pond.	Motor.
Lathe, 14 in. taper attachment	Niles-Bement-Pond.	Motor.
Sensitive drill, 12 in	Knecht	Belt.
Turret, 18 in. Fox	Warner & Swasey	Belt.
6 Shelves, 36 in. x 20 in	New Britain.	

FRAMES.

Slotter, 18 in. (2 independent tools)	T. C. Dill	Motor.
Planer, low rail, 60 in. x 60 in. x 18 ft., 4 heads	Niles-Bement-Pond.	Motor.
Radial drill, 7-ft. heavy, double base	Dresses	Motor.

TOOL ROOM.

Tool room grinder, universal	Walker	Belt.
Cutter grinder, No. 2	Cincinnati	Motor.
Grinder, twist drill	Wm. Sellers	Belt.
Grinder, tool, universal	Wm. Sellers	Motor.
Tool room grinder, 12 in. universal	Walker	Motor.
Miller, universal, rack cutting	Hendy	Belt.
Sensitive drill, 12 in	Knecht	Belt.
Radial drill, 3-ft	Niles-Bement-Pond.	Motor.
Shaper, 15 in. universal	Potter & Johnson.	Motor.
Grinder, double spindle, horizontal att.	Springfield	Belt.
Lathe,, 16 in	Hendey-Norton	Motor.
Lathe, 18 in	Hendey-Norton	Motor.
Center drill, 3 in. single spindle	Whiton	Belt.
Filing machine, No. 2	Cochrane-Bly	Belt.
Grinder, staybolt dies	Modern	Belt.
Grinder, auto saw	Higley	Belt.
8 racks, No. 172, revolving	New Britain.	
4 shelves, 36 in. x 20 in	New Britain.	

ECCENTRIC STRAPS AND BLOCKS.

Eccentric mandrel	Underwood.	
Boring mill, 51 in	Niles-Bement-Pond.	Motor.
Boring mill, 42 in. rapid reduction	Bullard	Motor.
Keyway mortiser	Morton	Motor
1 laying-off table	C. of Ga.	
1 work-bench, standard	C. of Ga.	
Radial drill, 6-ft	Niles-Bement-Pond.	Belt.

MISCELLANEOUS—STATIONARY.

Lathe, 37 in	C. of Ga.	Belt.
Planer, 36 in. x 36 in. x 14 ft.	Niles-Bement-Pond.	Belt.
Boring mill, horizontal	Niles-Bement-Pond.	Belt.
Lathe, 24 in	Le Blond	Belt.
Drill, 36 in. vertical	Foote-Burte	Motor.
Power hack saw, small	Q. & C.	Belt.
Belt lacer	Jackson	Hand.
Cold saw, 14 in. combination	Newton	Motor.
Slotter, 14 in	Wm. Sellers	Belt.
Oil separator	American Cent	Belt.
Scale. 5-ton, compound suspension	Fairbanks.	
Center drill, 4 in. stock	Whiton	Belt.
3 time recorders	International.	

ERECTING.

2 vertical drills, 36-in	Foote-Burte	Motor.
Portable furnace, braces, etc	Ferguson	Oil.
2 floor grinders, "D"	Springfield	Motor.
Valve setter	Farrington-Mills	Air.
Crank pin press, 100-ton, hydraulic	Dudgeon.	
Dome facer	Underwood.	
Crank pin turner	Underwood.	
Valve seat facer	Underwood.	
Cylinder boring bar, 4 in	Ryerson	Motor.
4 air drills, close corner, No. 8	"Thor."	
1 air drill, No. 6, non-reversible	"Thor."	
2 air drills, No. 1 piston	"Thor."	
1 air drill, No. 2 piston	"Thor."	
1 breast drill, No. 10	"Thor."	
3 chipping hammers, No. 5	"Thor."	
21 work-benches, special, with 2 in. Merritt 6 in. vises each		
6 vise stands, 5 in. portable	New Britain.	
1 burner for testing locomotives	Tate-Jones	Oil.

ROUNDHOUSE EQUIPMENT.

Lathe, 24 in	Le Blonde	Motor.
Volume blower, heating system	American	Motor.
Lathe, 14 in	Reed	Motor.
Vertical drill, 36 in	Foote-Burte	Motor.
Hydraulic press, 100-ton	Watson-Stillman	Motor.
Shaper, 30 in. draw-cut	Morton	Motor.
Cylinder and valve seat facer	Underwood	
Air-valve setter	Farrington-Mills.	
Hydraulic crank pin press	Watson-Stillman.	
Sensitive drill, 12 in	Knecht	Belt.
Turret head, bolt cutter, No. 4	Pratt & Whitney	Belt.
Pipe machine, 3 in	Bignall & Keeler	Belt.
Drop apron grinder, No. 5	Bridgeport	Motor.
Punch and shear, No. 17	White.	Motor.
Double head grinder	Bridgeport	Belt.
Center drill, 2-in. 2-spindle	Pratt & Whitney	Belt.
Saw, No. 16	Higley	Motor.
Crank pin turner	Underwood.	
Dome facer	Underwood.	
Boring mill, 72 in	Niles-Bement-Pond.	Motor.
Wheel lathe, 80 in	Niles-Bement-Pond.	Motor.
Rolls, No. 1	Hilles & Jones	Motor.
Vertical turret, 36 in	Bullard	Motor.
Pipe bender	Underwood	Air.
Bolt alterer	Potter & Johnson.	Belt.
Motor (New Shop), 15-h.p	Westinghouse.	
Motor (Tool Room), 15-h.p	Westinghouse.	
Motor, portable, 3 h.p	Westinghouse.	
Crane, 5-ton trolley	Niles-Bement-Pond.	Motor.
Vacuum pump, heating system	Ill. Engr. Co.	Steam.
2 turbine pumps, boiler washing	Alberger	Motor.
Grease forming machine	Underwood.	Air.
Hose mounting outfit, 20th century	Baker & Carr	Air.
Turntable tractor	Nichols.	Motor.
Sand dryer	Robertson.	
2 time recorders	International.	
Boiler tester	Bellfield.	
4½ in. boring bar	Underwood	Belt.

BOILER SHOP EQUIPMENT.

Vertical drill, 44 in	Foote-Burte	Motor.
Horizontal flange drill	Beaman & Smith.	Motor.
Radial drill, 6-ft	Bickford	Motor.
12-ft. plate planer	Cleveland	Motor.
Large annealing furnace	Ferguson.	Oil.
2 hydraulic pumps, triplex	R. D. Wood	Motor.
Hydraulic accumulator	R. D. Wood	Hydr.
Hydraulic flanging press, 200-ton	R. D. Wood	Hydr.
Hand clamps	C. of Ga.	Hand.
Bending rolls, 12-ft	Cleveland.	Motor.
Horizontal punch	Cleveland.	Motor.
Punch, 60 in. cap	Cleveland.	Motor.
Shear, 60 in. cap	Cleveland.	Motor.
Angle shear	Long & Allstatter.	Motor.
Rotary bevel shear	Lennox	Motor.
Punch, ½ in. plate	Lennox	Motor.
Friction saw	Ryerson	Motor.
Rotary shear	Kling	Motor.
Rollers, 8-ft		Belt.
Drill grinder, No. 1½	Champion.	Belt.
Sensitive drill, 12 in	Knecht.	Belt.
Vertical drill, 36 in	Foote-Burte	Motor.
Hand rolls	C. of Ga.	
Grinder	Springfield	Motor.
2 flue cutters	Fox	Motor.
Welding machine, flues	McGrath	Air.
Welding furnace, flues	Ferguson	Oil.
Safe end furnace, flues	Ferguson	Oil.
2 rivet furnaces	Calorex	Belt.
Rivet furnace (tanks)	Ferguson.	Oil.
Flue rattler	C. of Ga.	Motor.
2 portable rivet furnaces	Ferguson	
Mud ring riveter	Ryerson	Hy.-Ar
Staybolt nipper	W. H. Foster	
Double punch and shear, tanks	Hilles & Jones	Belt.
Drill grinder, No. ½	Champion.	Belt.

BLACKSMITH SHOP TOOLS.

Steam hammer, 3,000 lbs	Niles-Bement-Pond.	Steam
Steam hammer, 1,000 lbs	Niles-Bement-Pond.	Steam
Steam hammer, 800 lbs	Niles-Bement-Pond.	Steam
Steam hammer, S. F., 800 lbs	Ryerson	Steam
Steam hammer, S. F., 600 lbs	Ryerson	Steam
Steam hammer, S. F., 400 lbs	Minningham	Steam
2 steam hammers, S. F., 200 lbs., treadle	Ryerson	Steam
Steam hammer, 1,000 lbs	Chambersburg	Steam
Steam hammer, 1,600 lbs	Chambersburg	Steam
Gorging press, 400 ton	Chambersburg	St-Hy.
Scrap rolls	Ajax	Motor.
Guillotine shear, outside stock	Hilles & Jones	Motor.
Guillotine shear (gantry)	Hilles & Jones	Motor.
Trimming press, No. 7	White	Motor.
Forging machine, 4 in	Ajax	Belt.
Forging machine, 2½ in	National	Belt.
Forging machine, 1 in	National	Belt.
Bolt cutter, 2 in. triple head	Acme	Belt.
Pressure blower (furnaces), 45-h.p	American	Motor.
Volume blower (forges), 25 h.p	American	Motor.
Eye bender, No. 2	Obermayer	Hand.
Eye bender, No. 3	Obermayer	Hand.
Bolt bender, 2½ in.	Ajax	Motor.
2 oil furnaces, No. 1	Ferguson	Oil.
Oil furnace, No. 184 (for 400-ton press)	Ferguson	Oil.
Oil furnace, No. 143 (for 3,000-lb. hammer)	Ferguson	Oil.
Oil furnace, No. 136 (for 1,000-lb. hammer)	Ferguson	Oil.
Oil furnace, No. 3 (for bolts)	Ferguson	Oil.
2 oil furnaces, No. 2 (for bolts)	Ferguson	Oil.
Oil furnace (spring banding)	Ferguson	Oil.
Oil furnace, bulldozer (scrap rolls)	Ferguson	Oil.
Oil furnace, combined case-hardening and spring	Ferguson	Oil.

Oil furnace, special for spring-ptg. rolls..	Ferguson	Oil.
Punch and shear (spring work).....	Evans	Motor.
Pointing rolls (spring work).....	Evans	Motor.
Gas furnace, No. 60, Chloro. (tool dresser)	Stewart	Gas.
Gas furnace, No. 1 preheater (tool dresser)	Stewart	Gas.
Gas furnace (high-speed steel-tool dresser)	Chicago	Gas.
Pyrometer (tool dresser).....	Hoskins.	
Punch and shear.....	Hilles & Jones ...	Motor.
Air bender.....		
Spring bending machine.....		
Bolt cutter, triple head.....	Acme	Belt.
Bolt cutter, single head.....	National	Belt.
Oil furnace, No. 135.....	Ferguson	Oil.
Bolt cutter, double head.....	Steele-Harvey	Belt.

WOOD WORKING TOOLS.

Mortiser, 6 in. horizontal.....	Greenlee	Belt.
Post borer, 2-spindle.....	Niles-Bement-Pond.	Belt.
Shaper, 2-spindle, No. 85.....	F. & E.	Belt.
Hand jointer, 16 in.....	Greenlee	Belt.
Grinder, revolving oilstone.....	Mummert.	Belt.
Grindstone	C. of Ga.	Belt.
Knife grinder.....	F. & E.	Belt.
Mortiser, 6 in. horizontal.....	Greenlee	Belt.
Cut-off saw, 24 in.....	C. of Ga.	Belt.
Rip saw, 28 in.....	F. & E.	Belt.
Band saw, 16 in.....	F. & E.	Belt.
Tenoner, No. 12 double.....	F. & E.	Belt.
Planer, 7 in. x 30 in.....	F. & E.	Belt.

TOOLS FOR NEW CAR SHOP.

Sensitive drill, 12 in.....	Knecht	Belt.
2 pressure blowers, blacksmith.....	American	Motor.
Heating fans.....	American	Motor.
2 shaving exhaust fans.....	Sav'nah Blow-Pipe	Motor.
Furnace, Ferguson, No. 146.....	Ferguson	Oil.
Furnace, No. 105.....	Ferguson	Oil.
Wet grinder	Heald	Belt.
Emery grinder, No 1½.....	Champion	Belt.
Knife grinder, 30 in. diamond.....	Diamond	Belt.
Power hammer	Beaudry	Belt.
Lathe, 14 in.....	Lodge & Davis ...	Belt.
Lathe, axle, double head, No. 4.....	Putnam	Motor.
Bushing press, 100-ton.....	Chambersburg ...	Motor.
Punch and shear, No. 1.....	Long & Allstatter.	Motor.
Pipe threader, 3 in.....	Wieland	Belt.
Pipe threader, 6 in.....	Wieland	Belt.
Nut tapper, 4 in. spindle.....	National	Belt.
Emery grinder and buffer.....	C. of Ga.	Belt.
Triple valve tester.....	Westinghouse	Belt.
Pipe bender.....	Pedrick & Smith..	Air.
Wood turning lathe.....	C. of Ga.....	Belt.
Boring mill, wheel, 42 in.....	Rogers.	Belt.
Axle lathe.....	C. of Ga.....	Belt.
Riveting machine, column.....	Pittsburgh	Air.
Small press (brake beams).....	C. of Ga.....	Hydr.
Axle lathe (straightening).....	Wm. Sellers	Belt.
Bender (brake hangers).....	C. of Ga.....	Air.
Lathe, 14 in.....	C. of Ga.....	Belt.
Wheel press, 130-ton.....	Niles-Bement-Pond.	Belt.
Wheel press, 300-ton.....	Niles-Bement-Pond.	Motor.

CAR SHOP YARD.

15-ton electric traveling crane.....	Shaw	Motor.
Alligator shear.....	C. of Ga.....	Motor.
Rolls	Ajax	Motor.
Bulldozer furnace.....	Ferguson.	
Hammer furnace.....	Ferguson.	

PLANING MILL EQUIPMENT.

Post borer, double spindle.....	S. A. Woods	Motor.
Post borer, 5-spindle, No. 163.....	F. & E.	Motor.
Gainer	Green.	Motor.
Core machine, pattern shop.....	Fox.	
Mortiser, 14 in. upright.....	F. & E.....	Belt.
Mortiser, hollow chisel.....	.....	Motor.
Molder, 6 in. x 10 in.....	S. A. Woods	Motor.
Molder, 2-spindle upright.....	F. & E.	Belt.
Jointer, 30 in.....	F. & E.	Motor.
Planer, 24 in.	F. & E.	Motor.
2 planers, 4-side matcher.....	S. A. Woods	Motor.
Cut-off saw, swing, No. 235.....	Berlin	Group.
Cut-off saw, swing.....	Berlin	Motor.
Cut-off saw, 46 in.....	Greenlee.	Motor.
brace cutter.....	Greenlee	Belt.
Rip saw, 14 in.....	F. & E.....	Belt.
Rip saw, self feed, No. 426.....	Greenlee	Motor.
Rip saw, self feed.....	Greenlee	Belt.
Band saw, 44 in.....	Atlantic	Group.
Tenoner, 4 in. x 6 in.....	F. & E.	Motor.
Tenoner, No. 525 vertical.....	Greenlee	Motor.
Trimmer (pattern shop).....	Oliver	Hand.

EXPERT VIEWS ON SIGNALING.

At the hearing on the Croton collision,* which was held by the New York State Public Service Commission in New York City, January 17 and 18, the commissioners, Chairman Stevens and Mr. Sague, questioned a number of signal engineers at length as to what are the best practices in block signaling. We give below the principal answers of Messrs. Azel Ames, of the Block Signal & Train Board of the Interstate Commerce Commission; A. H. Rudd, of the Pennsylvania Railroad; F. P. Patenall, of the Baltimore & Ohio; H. S. Balliet, of the Grand Central terminal, New York City, and W. H. Elliott, of the New York Central & Hudson River.

*Rear collision at Croton, N. Y., on the New York Central, December 31. Details will be given in our accident record next week.

MR. AMES.

Mr. Ames said that he had been signal engineer on the Boston & Albany, the Lake Shore and the New York Central altogether about six years.

Q. Which is the safer, the controlled manual block system or the automatic?

A. The automatic is a very safe system because it discloses broken rails, misplaced switches, cars on sidings which stand foul of the main track, etc.

Q. How about the rules?

A. In the controlled manual the stop indications are positive, and the engineman cannot run past such a signal except by a written order. With automatic signals there is no signalman to issue the written order or card, and, as a signal may fail in the stop position and thus delay a train, the rules provide that after coming to a stop at a stop signal, a train may proceed with caution through the block.

Q. How are the two systems adapted to a dense traffic?

A. With short block sections a signalman cannot give the signals rapidly enough for trains following closely, and therefore the automatic is the only satisfactory system. There is no installation in this country of the controlled manual with short blocks and a dense traffic. [Such an installation was recently superseded by the automatic in Park avenue tunnel, New York.]

Q. Is there not an advantage in having a signalman to check carelessness on the part of enginemen?

A. The principal advantage in having signalmen is not to check the enginemen, but to observe passing trains and call attention to anything which may be wrong about the cars, etc.

Mr. Ames described the overlap and its functions and, replying to a question, said that enginemen, when not properly disciplined, do probably take advantage of the overlap to run past stop signals, knowing that, because of the overlap, such disregard of the signals is not likely to cause a collision. The disadvantage of the overlap is that it reduces the capacity of the road. The principal reason actuating those companies which have introduced the overlap appears to have been to make possible the use of the automatic stop. The New York Central (in the Park avenue tunnel) and the Pennsylvania (at one or two places experimentally) are about the only roads which have used the overlap without automatic stops. Mr. Ames would hesitate to recommend the overlap unless it were intended to use automatic stops.

Q. Is the ordinary American practice of visual signals (only) for the home signal at the entrance of each block section and a distant signal in the rear, to be looked upon as good practice?

A. Yes, it must be, because it is the general practice.

Q. What are the merits or automatic stops?

A. None as yet has had sufficient trial to make it such a device as the railways would want to use.

Q. What is the objection to an efficient automatic stop?

A. Speaking of railways generally and excluding the elevated and tunnel lines, which are protected from bad weather conditions, the objections are the difficulty of keeping the apparatus in order when there is deep snow, and the complications incident to a dense and complicated traffic [as distinguished from the simple traffic conditions on city passenger railways].

Asked further to compare controlled manual and automatic block signaling, Mr. Ames said that with signalmen there is introduced the liability to human error and also to tampering by operators from mere inquisitiveness; but he admitted that if the apparatus were properly locked and sealed, the chance that operators would juggle with the apparatus was remote. But where the apparatus is not well maintained and

frequently gets out of order, signalmen will become lax and not strictly obey rules. With the automatic system there is only one man to deal with in this connection, and that is the maintainer of the apparatus. There is no chance of collusion between the signalman and the maintainer because there is no signalman.

Q. Why was the overlap adopted in the Park avenue tunnel, New York City?

A. That tunnel has a history, and the company put in everything that could be thought of, including a cab signal which now would be classed as a poor one.

Q. Summing up, is there any objection to the overlap except that it diminishes the capacity of the line?

A. I think the impairment of discipline is the principal objection.

Q. Does the track circuit surely detect broken rails?

A. Yes, except where there is a good deal of foreign current in the rails.

Questioned as to cab signals, Mr. Ames said that he did not recommend any such signal. Asked if it were safe and proper to stop a train with its rear car only 12 ft. beyond a home signal, as was the case at Croton when this collision occurred, Mr. Ames said that he knew of no rule forbidding such a stop.

Q. Is the flagging rule insisted on more generally under the controlled manual system than where automatic signals are used?

A. I know of no difference in the rules as between the two systems.

After describing the general practice in Great Britain where the majority of lines have no controlled manual apparatus and no track circuit protection (but where manual block signaling is done by means of apparatus having visual indicators fixed on the signalman's table, so that he has constantly before him an indication showing what his last operation was) Mr. Ames was asked to compare English with American practice, and replied that either the controlled manual or the automatic, as used according to the best American practice, was better than the English practice described. The controlled manual is liable to be inoperative at times because of difficulty with the electric circuits.

Q. What are the advantages of moving the semaphore in the upper quadrant?

A. First, accumulations of ice and snow tend to move the signal to the stop position, thus making the signals safer than those in which ice and snow on the arm tend to move it to the clear position; and, second, it permits the introduction of the three-position principle on a road where the two-position lower-quadrant practice has been in vogue, without the disadvantage of some inconsistency in the aspects which would be involved if a change were to be made from the two-position to the three-position arrangement, while still keeping the movements in the lower quadrant.

Q. How serious is the danger from snow with the lower quadrant signals?

A. Very little unless there has been a previous sleet storm causing the snow to stick.

Q. Have you known of cases where signals were forced to the clear position by the weight of snow or ice?

A. Yes.

Q. What is the remedy?

A. To use the upper quadrant.

Q. How long has this danger from snow been known?

A. Twenty or thirty years.

Q. Why has nothing been done about it until recently?

A. With signals worked manually the counterweight could be increased, thus tending to overcome the difficulty from the weight of snow; but, with the general introduction of power signals where excessive counterweight was impracticable or costly, the difficulty with snow became more pronounced.

Q. Where is the upper quadrant used?

A. It is used on new work by the New York Central, the New York, New Haven & Hartford, the Pennsylvania and the Baltimore & Ohio.

MR. PATENALL.

F. P. Patenall, signal engineer of the Baltimore & Ohio, said that he had held that position 21 years. He has used the controlled manual system only on a few short sections; has used three-position automatic signals six years.

Q. What is the advantage of the controlled manual as compared with automatic?

A. You have the signalmen in the cabins to watch trains as they pass and call attention to anything that is out of order.

Q. What are the disadvantages of the controlled manual?

A. The additional machinery, introducing liability to failure and temporary suspension of the safeguards of the system; controversy and perhaps strife between the signalmen, who complain of defective machinery, and the maintainer who is employed to keep the machinery in order.

Q. What are the merits of the overlap?

A. We do not favor the overlap. Several years ago on our New York division we had overlaps and no distant signals, but where we have distant signals, we do not use the overlap. We are about to install signals on 160 miles, but without overlaps. Our standard signal apparatus and practice are substantially the same as the New York Central's. The objection to the overlap is that with it the signals tell the engineman a lie.

Q. Do enginemen take chances running past signals where there is an overlap?

A. When we had the overlap (20 years ago) they did.

Q. If the overlap had been in use at Croton the collision would not have occurred?

A. I do not concede that.

MR. RUDD.

A. H. Rudd, signal engineer of the Pennsylvania, began on that road in 1886. After a short time he went to the New York Central and thence to the New Haven and the Lackawanna, returning to the Pennsylvania six years ago. The Pennsylvania has no controlled manual except on six miles of single track. Overlaps are being tried on a short section near Pittsburgh, but thus far the trial has shown that the lengthening of the interval between trains causes congestion at interlockings.

The controlled manual, with continuous track circuit, as it is arranged on the New York Central, is about as safe as anything that can be found; but the expense is so great that it cannot be afforded where the blocks must be short. And, besides the expense, there is from 15 to 30 seconds' loss of time on each signaling operation, as compared with the automatic, and where trains are run close together this delay is cumulative, soon causing congestion.

Q. Is the automatic system as safe as the controlled manual?

A. Yes. The controlled manual was formerly safer because the signalman watched the engineman, but now the surprise checking, holding enginemen to their duty, takes the place of the signalman in this respect.

Q. Would the overlap have prevented the Croton collision?

A. Possibly so; no one can say.

The Pennsylvania lines west of Pittsburgh have the overlap in use on short sections of double track line. We believe that the safest way to manage trains is to keep them moving, and to do this those block sections in which there are interlockings must be made short. With overlaps this shortening of sections is made difficult. If you begin to predicate the arrangement of your signals on the assumption that enginemen will disregard them, there is no end to the chain of safeguards that must be added.

Q. How about the overlaps in the Park avenue tunnel?

A. As the tracks in the tunnel are free of switches, it is not objectionable; but the Hudson division, from New York to Albany, has many interlockings.

Mr. Rudd said that the three-position upper-quadrant normal-clear automatic signals put up by him on the Central division of the P., B. & W. four years ago, had proved highly satisfactory. The whole installation has worked six months at a time without failure.

Q. At Croton the signals may be said to have been in the transition state, the automatics being installed in the place of the controlled manual; was this an element in causing the accident?

A. I cannot see how it could be, if the engineman understood his signals.

Q. How can enginemen be made to understand and obey signals?

A. On the Pennsylvania surprise tests are being made all the time. The trainmaster, the assistant road foreman of engines and the supervisor of signals go out together, so that there is never any question of veracity in regard to a test. Four or five thousand tests are made monthly.

Q. Is the flagman an important element in safeguarding trains?

A. Our flagmen are held to their duty. If, however, the flagman can see the next signal in the rear and see that it indicates stop, he is not prompt in going back; that is hardly necessary. Out on the road where freight trains are run permissively the flagman do go back. In a bad storm they go back. On suburban lines where passenger trains are regular and frequent the block signals are depended on.

Q. What is the best method of insuring that an engineman will heed a stop signal?

A. Provide him with a good visual signal fixed alongside the track.

Q. Why not have something erected along the side of the track to indicate the approach to a distant signal?

A. That is not impossible; but there is always the liability at night that lights used for this purpose will be confused with other lights. Enginemen know their landmarks; they do not have to guess at the location of signals.

Q. What about audible signals?

A. A bell was used in the Park avenue tunnel when I was on the Central 15 years ago, but the sentiment of the signal engineering world is unfavorable to bells, for the introduction of such signals divides the engineman's attention. Bells get out of order and do not ring. This is the argument also against cab signals.

Asked about the upper-quadrant, three-position signal on the Central division of his road, Mr. Rudd thought that they had never had a false clear signal there.

Asked about torpedo machines, his objection was that sometimes the torpedo does not explode, and very often the magazine gets empty. The correct principle is to depend absolutely on visual signals, unless an automatic stop is to be used. We have not yet found a reliable automatic stop. I think we would all like to find one.

WILLIAM H. ELLIOTT.

Mr. Elliott has been signal engineer of the New York Central for six years and before that had long experience on the Chicago, Milwaukee & St. Paul. He was questioned about the relative merits of controlled manual and automatic signals, and in general expressed views in consonance with those of Messrs. Ames and Rudd. The automatic is simpler and therefore more reliable. If the controlled manual apparatus fails, the signalman is pretty apt to be guided by the indicator, and therefore the control apparatus does not have the effect of causing the human element to check the working of the apparatus. In the past the monitorship of the signalman in the cabin has been regarded as an additional safeguard, but the witness thought that on the whole the way to secure vigilance in enginemen was to maintain discipline rather than depend on either the control apparatus or a man in the cabin.

The permissive rule, under the automatic system, whereby trains do not wait at a stop signal, but "keep moving," conduces to safety, as if we have a rear collision it does not do such serious damage as when a train at rest is run into. Except with continuous track circuits throughout the block section and power-operated signals, the controlled manual is not anywhere near as safe as the automatic.

Asked about the overlap, Mr. Elliott said the chief objection to it was at interlockings, where, if a signalman has to change a switch unexpectedly, which necessitates setting in the stop position a signal (perhaps 3,000 ft. away, and out of his sight) which otherwise would indicate clear, he may thus suddenly display a stop signal immediately in front of an approaching train. If this is a long freight train the engineman will apply his emergency brake and quite likely cause a derailment thereby, and perhaps obstruct another track; and in such cases enginemen boast of how quickly they have applied the brakes. Mr. Elliott would not use the overlap unless he were to use automatic stops.

In the Park avenue tunnel the blocks are 1,200 ft. long and the speed limit is 45 miles an hour. The best practice in automatic signaling on single track is to stagger the signals 500 ft. to 1,000 ft.

Q. Considering safety alone, which is the most perfect system?

A. The automatic.

Mr. Elliott presented statements of failures of automatic signals on the New York Central in 1908 and 1909. The number of signals in 1908 was 757; number of failures, 397. The ratio was one failure to 25,646 movements.

The main element of superiority in the three-position signal is that the engineman does not have to remember the aspect of a signal which he has passed, but can be guided wholly by the single signal that is before his eyes.

MR. HULL.

S. P. Hull, engineer of maintenance of signals of the New York Central, gave testimony as to conditions on the Hudson division. Asked what causes had produced false clear signals he said that a piston of a dash pot had got slightly out of place, but this faulty design had been corrected. Armatures of track relays have been known to stick, but a relay has now been designed in which this difficulty is overcome, so that practically this trouble never occurs, "judging from our records."

MR. BALLIET.

H. S. Balliet, engineer of maintenance of way of the Grand Central terminal and signal engineer of the electric division, has had charge of the signals here for five years, and before that had long experience on the Lehigh Valley. As to the relative merits of controlled manual and automatic signals, his views were substantially similar to those before given. His experience with full block overlaps (1,200 ft. blocks) leads him to believe it hardly desirable to stop trains so often as is necessary under that arrangement.

The limit of speed in the Park avenue tunnel is 35 miles an hour.

The trouble at interlockings where the overlap is used, as described by Mr. Elliott is not serious, the witness thought. The putting of the signal to the stop position momentarily while a switch is turned is the same as putting out a flagman to be ready to stop the train in case the switch should stick before its stroke could be completed.

Mr. Balliet's experience with bells in the tunnel during the past five years has been unfavorable; the contacts got burnt and were clogged with grease. With the Miller cab signal also the relay contacts caused trouble.

HARLEM RIVER BRANCH IMPROVEMENTS; NEW YORK, NEW HAVEN & HARTFORD.

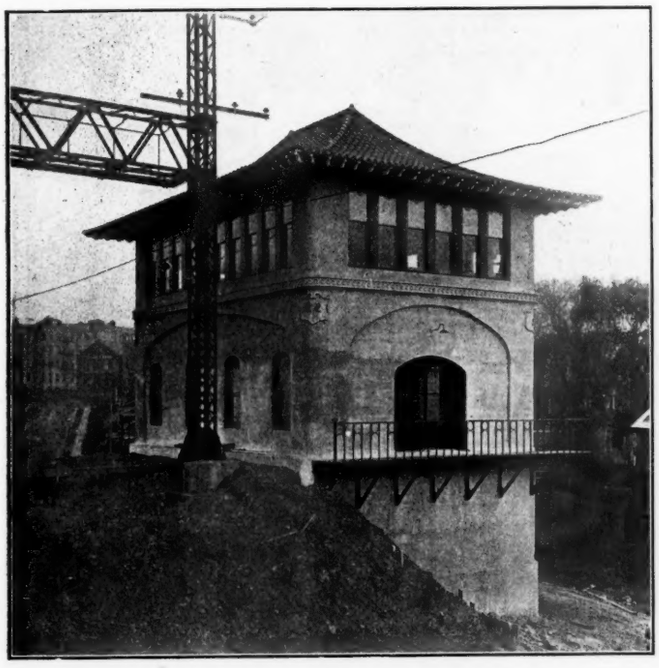
II.

There are two six-track Scherzer rolling lift bridges. The one shown herewith is that over the Bronx river. A similar bridge crosses the channel of Pelham bay.

The bridges carrying highways over the railway were designed for a 4-in. pavement of asphalt, or a 3-in. wood block pavement on a 1-in. cushion, carried on concrete arches between the stringers. The design of these bridges was made more difficult than usual because of the clearance requirements, resulting in shallow girders with thick webs and large angles. The sidewalks are carried on brackets, which had to be made so shallow that reinforced plates were used outside the flange angles, and plates on the top flange were carried through the main girders and secured to the floor-beams, giving sufficient anchorage. The photograph of the roadway on the Main street, Baychester, bridge, shows the peculiar curb used. Because of the slope of the roadway and the thickness of concrete at the crown of the concrete arches, etc., the curb had to be made so high as to interfere with the hubs of wheels. It was therefore made in two steps, as shown, giving an offset sufficient to clear the hubs. This was also used on girder spans for the sake of uniformity, although since the main girders separate the roadway from the sidewalk, it was necessary only when through trusses, such as the Main street bridge, were used.

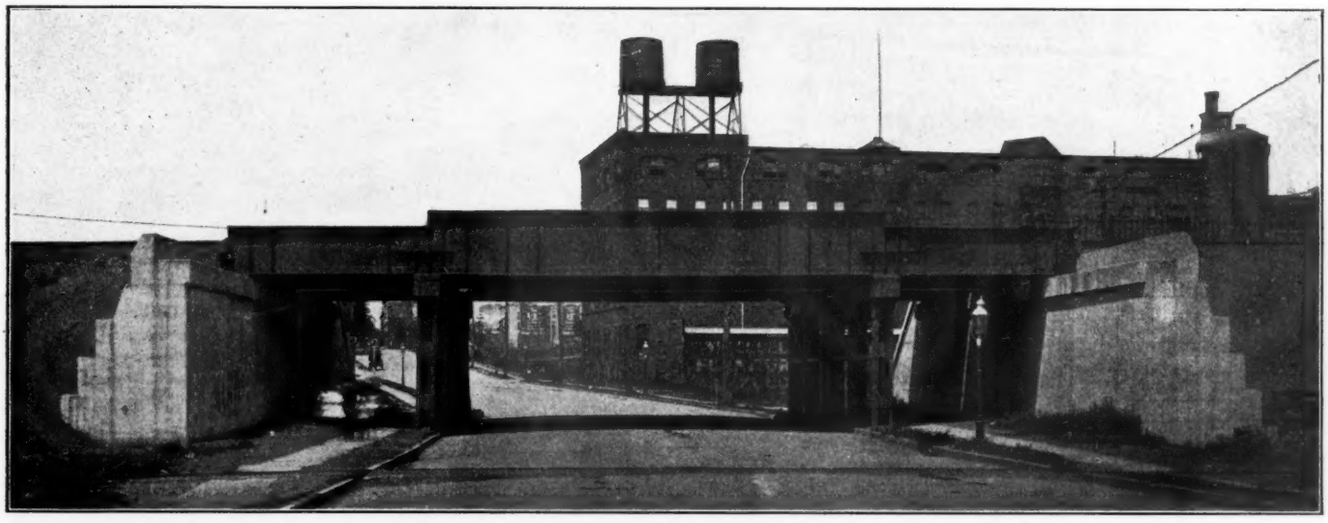
At the outside of the sidewalks a fascia girder, riveted to the brackets, extends up to the top of the sidewalk. Above this is a light girder set 3 in. clear above the sidewalk, with a pipe railing above.

It was first intended to extend the concrete, forming the arches between stringers, down so as to encase all metal on the underside of the bridge, and also to make a level concrete ceiling hung from the stringers by rods hooked through the webs of the I-beams. The purpose of this flat ceiling was to cover all pockets where gases and smoke might collect. The clearance limits, however, prevented this, and, as built, the bottoms of girders, floor-beams and stringers are exposed. For the Baretto street bridge there was enough clearance to use a deck girder bridge. Five girders were used, the support of sidewalks on brackets being unnecessary. Westchester avenue crosses the tracks on a curve, another street joining it at the bridge, so that the structure is 188 ft. wide at the west abutment and 117 ft. at the east abutment. The tracks here are on a 3-deg. curve and a 0.6 per cent. grade, this being the steepest grade on the branch, and, with one excep-



Signal Tower at New Rochelle.

Interior of Morris Park Station.



Bridge Over 134th Street.

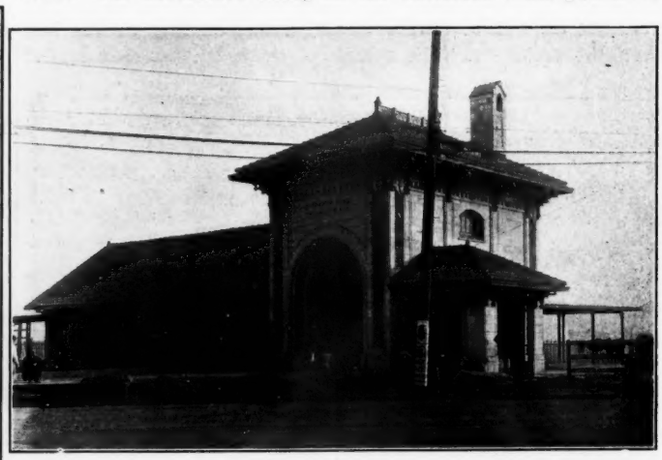
tion, the sharpest curve. The specifications for thickness of pavement, crown of street and provision for a pipe 36 in. outside diameter made the design of this bridge a serious problem. It was not practicable to raise the street, so finally it was decided to lower the tracks and spread them so that two trestles could be built to carry the structure. The trestles rest on curved piers. The bridge consists of 20 stringers, each of which rests on both trestles and overhangs 8 ft. on each side toward the abutments. From these cantilever ends 15-in. stringers extend to the abutments. The girders at the sides carry the ends of the stringers cut off by the skewed sides of the bridge.

The Leggett avenue bridge is a three-span bridge, crossing the tracks at the north end of the Oak Point yards. It carries a 100-ft. road.

The stations are of concrete, on steel framing, except the one at Pelham Manor, which is of stone. They are unusual in general design and in decorative details. As the photographs show, the character of each is dependent on its location. The Hunts Point station is carried entirely on a bridge. It was therefore made as light as possible and was also designed to give an impression of lightness. This effect is gained, in part, by the high, peaked roof and dormer windows. The decorative tiling on the outerside walls preserves the lines of the steel framework. The Port Morris station, on the other hand, is built on solid ground and is correspondingly massive. At Westchester avenue both ideas are present. Part of the building is on a bridge and part on the ground, and the design of each part is in keeping with its foundation. Pelham Manor station was built of stone to harmonize with an existing retaining wall which was a feature of the station approach.

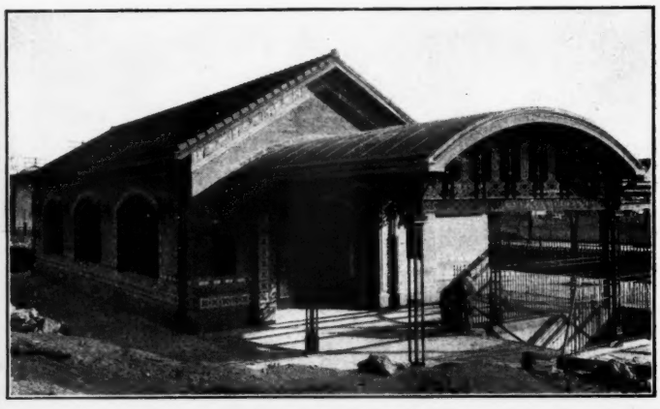
The design of the signal towers is in accordance with the

Woodside Station.

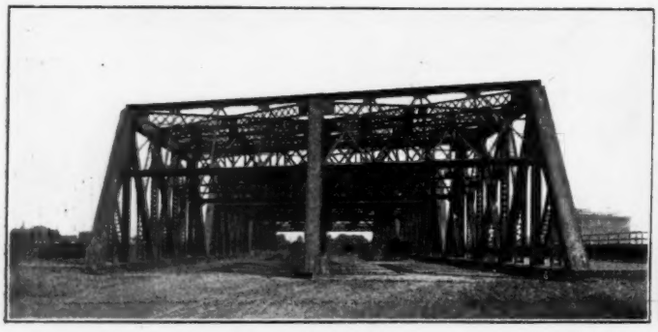


Westchester Avenue Station from Street Level.

Interior of Hunts Point Station.

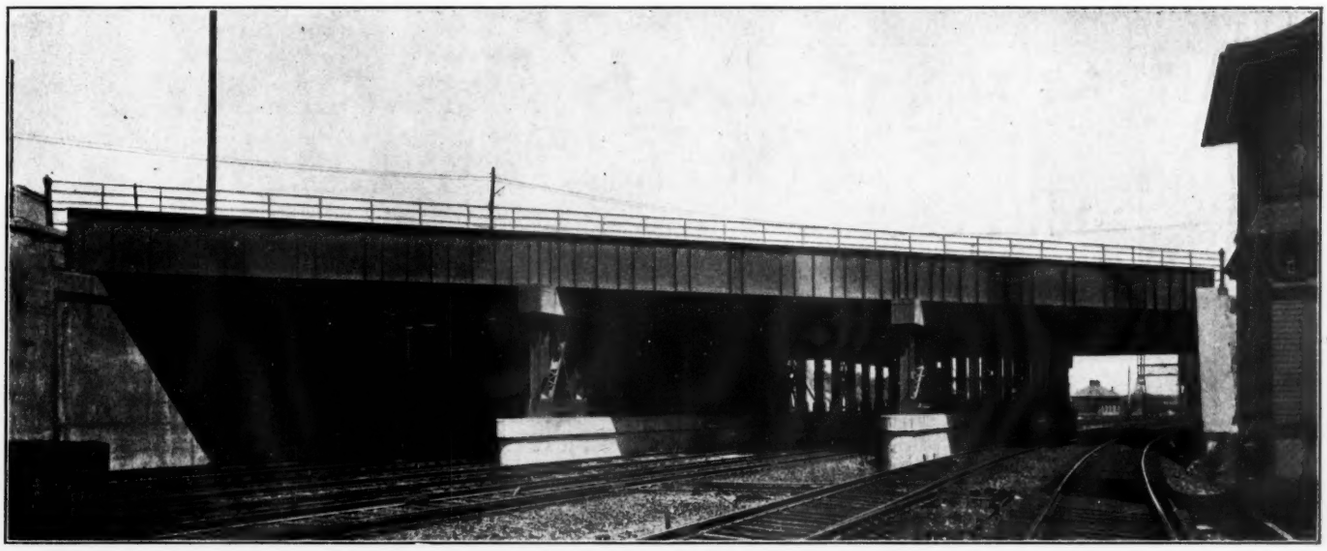


Morris Park Station.

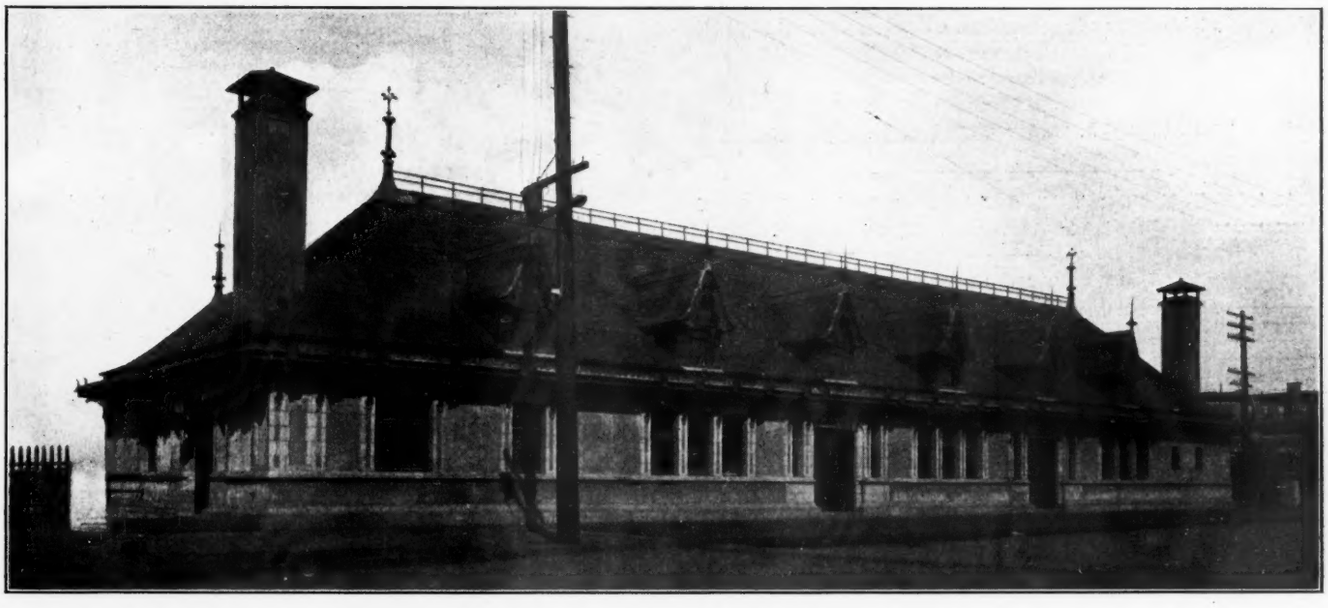


Leggett Avenue.

East 172d Street.



Westchester Avenue.



Hunts Point Station, from Street Level.

Main Street Bridge, Baychester.

new New Haven standards. Several have been erected at different points on the New York, New Haven & Hartford, and it is intended to gradually replace old structures with them. These fireproof structures are easy to maintain, and it would seem most desirable to have a safe building for housing the expensive apparatus which is put inside of it. The pagoda roof is not only in keeping with the general style of the building, but is also required for practical reasons. Deep eaves of some kind are necessary to keep the sun out of the windows, as shades or awnings obstruct the clear outlook which the tower men require. The forms used for placing the concrete were of wood, but lined with galvanized iron. This made it simple to mold the rounded corners and gives the concrete a smooth surface. Unlined wooden forms seem to act like blotting paper, absorbing water from the concrete before it sets. This may make the concrete softer; at least, concrete which has set against the iron surface is harder than usual.

The umbrella sheds shown in several of the photographs are standard on the Harlem river branch. The columns are built up of a web and angles, flaring apart at the top as shown. The roof is of corrugated asbestos lumber, with gutters at the eaves discharging to down-spouts set alongside columns at intervals. These sheds cost about the same per linear foot as ordinary wooden sheds, and their life is indefinite.

We are indebted for photographs and information to E. H. McHenry, vice-president of the New Haven, and to Cass Gilbert, who designed the stations; and for bridge details to a paper presented before the Brooklyn Engineers' Club in October, 1908, by H. C. Keith, who designed them.

TOOL LAY-OUT FOR THE SCRANTON SHOPS OF THE DELAWARE, LACKAWANNA & WESTERN.

BY GEORGE L. FOWLER,
Associate Editor of the *Railway Age Gazette.*

[WITH AN INSET.]

In the *Railway Age Gazette* for December 3, 1909, there was published the list of tools that have been specified for use in the new Scranton shops of the Delaware, Lackawanna & Western; a list that is probably the most complete and most scientifically worked out of any in existence. Through the courtesy of T. S. Lloyd, superintendent of motive power, and the assistance rendered by S. S. Riegel, mechanical engineer for the company, under whose direction the drawing was prepared, it is now possible to present the arrangement and grouping of the tools on the floor of the shop.

By referring to the list published on December 3, it will be seen that, in the analysis of the work to be done accompanying the list of tools, it was grouped under the natural heads into which it would fall in the construction and repair work of the locomotive. For example, there are such groups as tire and wheel center work, frames, axles, rods, crossheads, valves and motion work, engine and tender trucks and so on. So, in the arrangement of the tools the same grouping has been followed, with the result that the shop, as a whole, is built up of a number of components, each complete in itself, and each devoted to its own speciality. This arrangement of tools required quite as much of systematic analysis as did the preparation of the original list. In the making of the latter it was only necessary to take up each step of the work to be done, decide upon the time which it would require and select the proper tool to do it. It could be considered by itself and, where of sufficient quantity to warrant the purchasing of a special tool, with entire independence of everything else. But, in locating the machine it was necessary to look at it with reference to its connection with other tools. It must be placed with special reference to the other classes of work with which it is to be associated. The groups must be so arranged with reference to each other that they can co-operate and pass material along. In short, it was quite as necessary that there should be good team work not only between the various groups, as well as the elements of each group as it is that it should exist in any other organization from football up.

Therefore, after the tools had been selected, there was a long period of careful study and of adjustment and readjustment in this location. Each machine was plotted in its outside clearances and fitted into its place on the plan with the group in which it was associated. Then, when the office force and the responsible officers had done what they could the foremen were called in and each turned loose to criticize and suggest. The purpose of the grouping was explained and the method of handling material shown, and then these men who are to have the immediate supervision of the work proposed such changes as seemed desirable. Finally, when all were satisfied that they had done their best, the arrangement shown was adopted and the setting of the machines commenced.

With this preliminary work done, the rapidity of installation has been greatly enhanced. The thing is settled. There is nothing further to be discussed. There is no waking up with a start at the realization that something has been overlooked. The plan is made, and the only thing to do is to follow it blindly, with full confidence that the desired results will be attained.

It is the final solution of this problem of grouping that is shown by the accompanying inset. It will be seeen that the arrangement of the list has not been necessarily followed on the floor. That is to say, two groups following each other in the list may be somewhat widely separated in the shop. For example, the group for frame work, No. 1, is separated by the width of the shop from the axle group, No. 10. It would be well, however, for those who wish to make a systematic study of the methods followed in this layout to read and examine in connection with the issue of December 3, 1909, as this will greatly facilitate a proper understanding of the method followed.

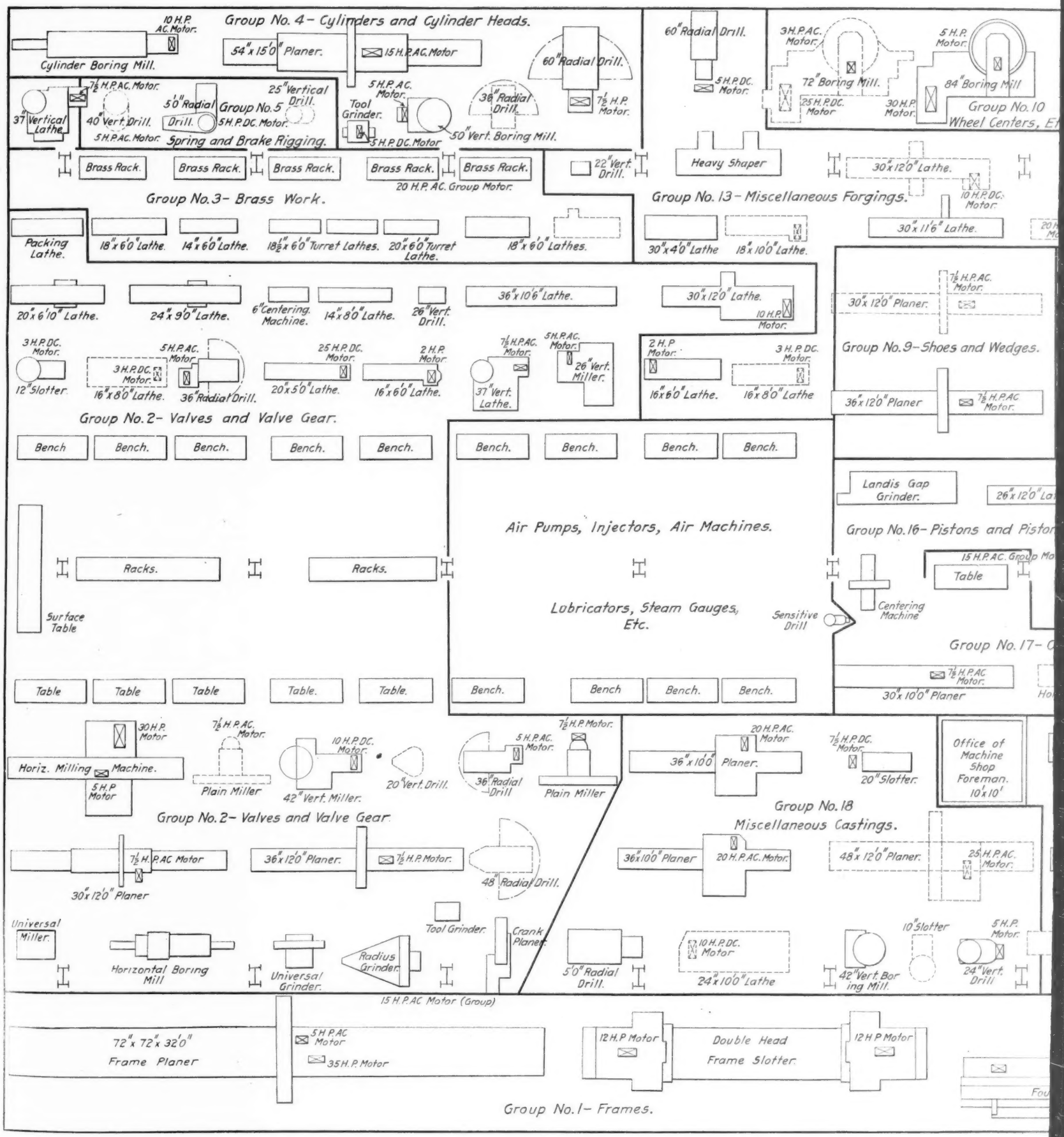
Before entering into the details of the tool arrangement, attention is called to the methods of material distribution that are available. From the description of the shops published on November 5, 1909, it will be recalled that each bay of the shop is served by one or more traveling cranes, which span it, and that these is also a series of subways by which material may be brought in from the blacksmith shop or foundry, raised to the floor level by elevators and thence carried to the several tools by the cranes.

Starting in, then, with the group of frame finishing machines, we find from the list that the work is done on three machines, a planer, a slotter and a 4-head drill. These form the first group and are located in the northwest corner of the floor, in the bay next the erecting pits, served by high-capacity cranes. They are set in line so that the rough frame may be placed upon the planer, then taken to the slotter and finally to the drill without doubling back. To these machines a fourth will probably be added later, a 36-in. by 15-ft. planer, as shown in dotted lines, No. 67.

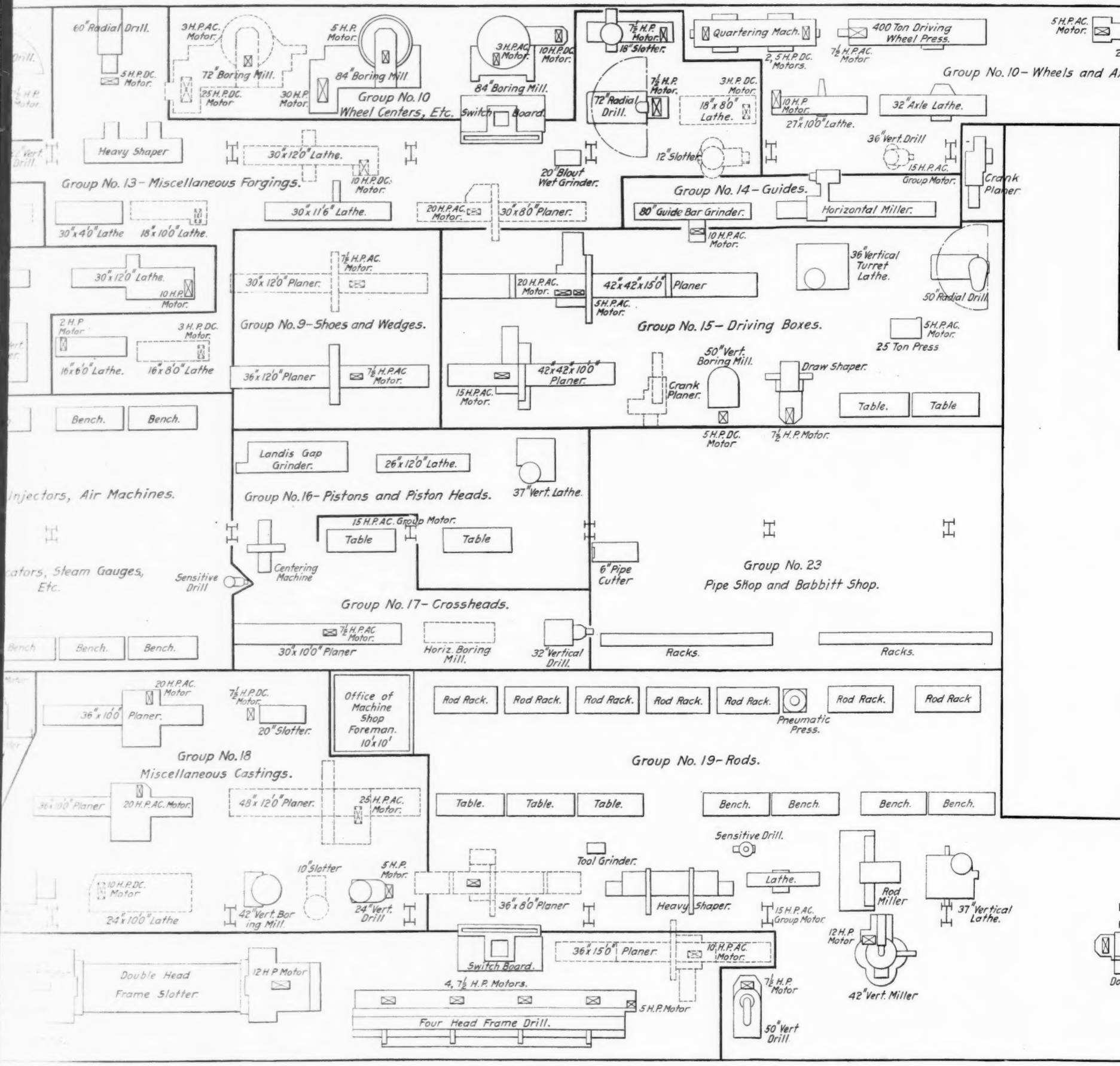
In this plan the tools to be set at once are indicated by full lines and the proposed tools by dotted lines, and each group is shown surrounded by a heavy black line.

This proposed planer, No. 67, was not included in the original tool list, but has been provided for in case the heavy machine should be overtaxed or it should appear to be more economical to use a lighter one for front and back rails and light frames. After finishing, the frames can be picked up and carried direct to the proper erecting pit if on the same side of the shop. If not, they are loaded upon a car, carried across to the other side and there handled by the corresponding traveling crane.

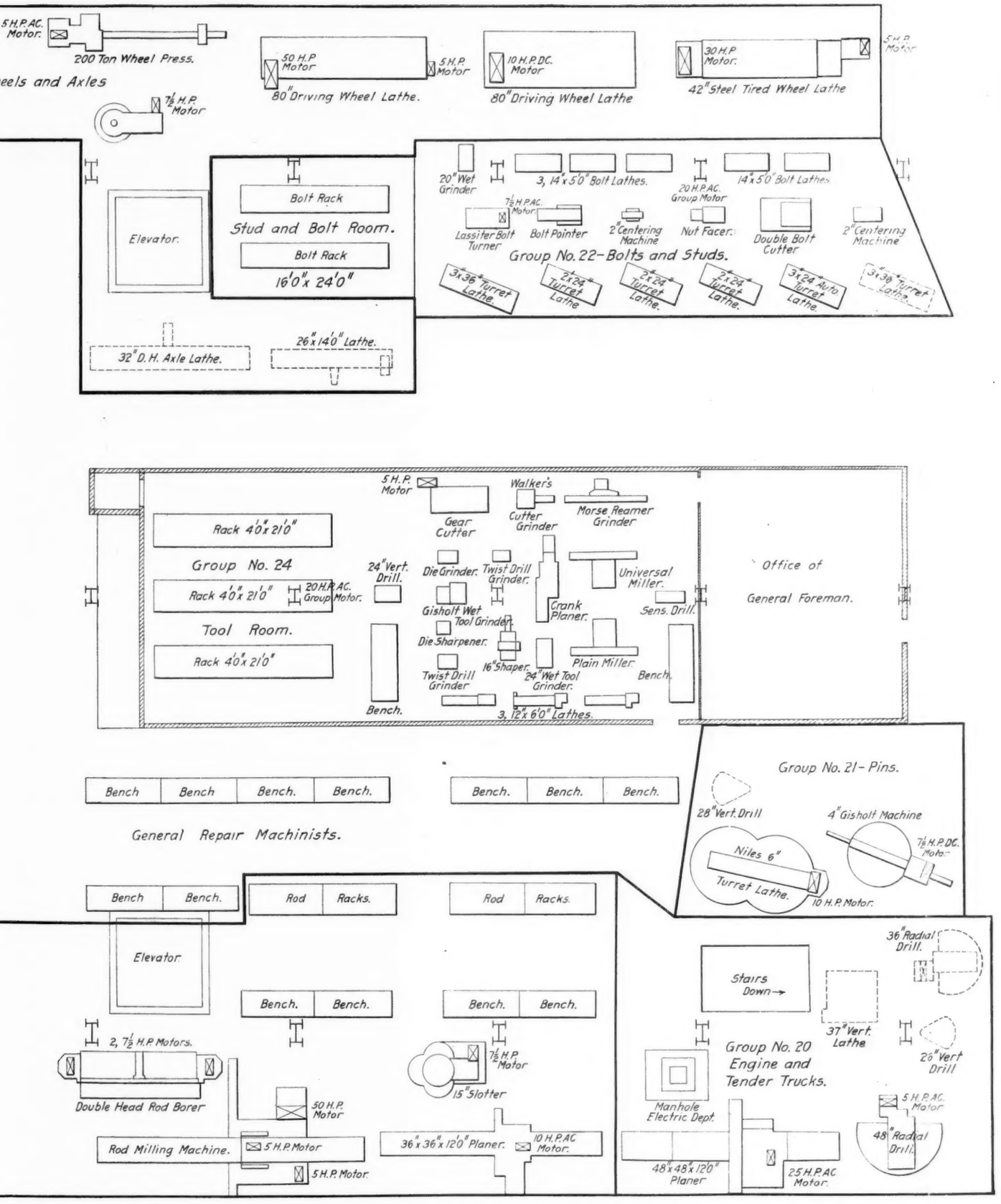
Moving on from these exceedingly simple operations em-



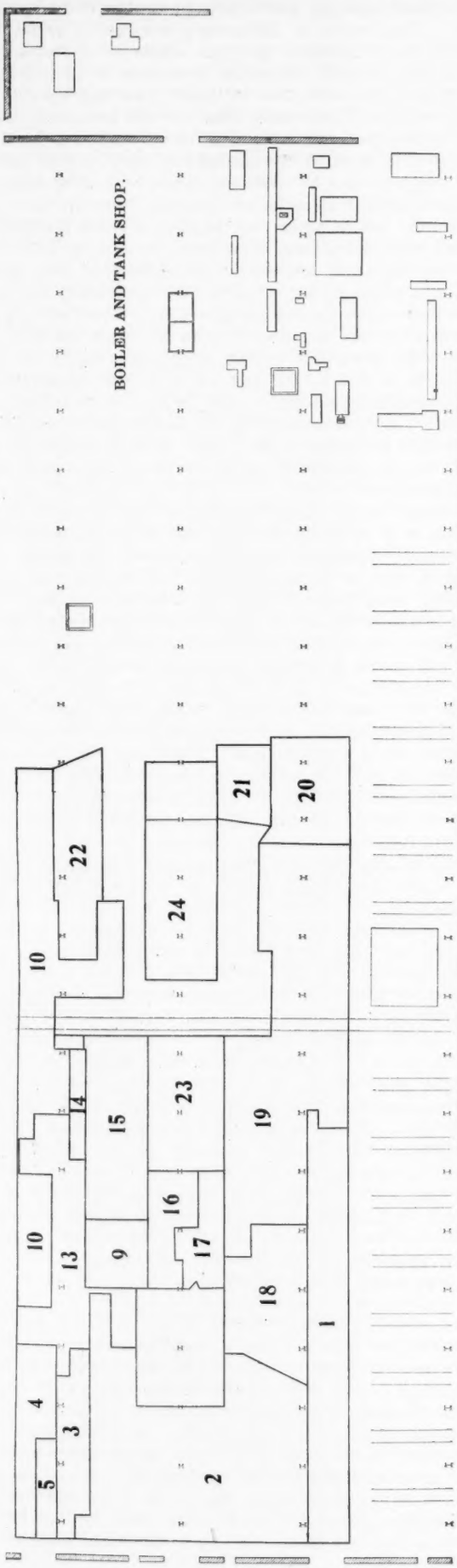
PLAN ILLUSTRATING TOOL LAYOUT AND G



PLAN ILLUSTRATING TOOL LAYOUT AND GROUPING IN THE NEW LOCOMOTIVE SHOPS OF THE DELAWARE, LACKAWANNA & WESTERN



& WESTERN, AT SCRANTON, PA.



Location Plan, Showing Relation of Machine Tool Grouping to the Boiler and Tank Shops.

braced in the frame work, we come to group No. 2, which is the largest and most complex in the shop. It is that of the valves and valve gearing, and includes not only a great variety of work, but an equally varied number of operations. It includes the work on the valves themselves, the lifting shafts and boxes, union bars for the Walschaerts gear, the valve rods, eccentric cranks, throttle and reverse lever quadrants, reverse lever, throttle and reverse lever latches, valve yokes and rods, eccentrics, with the straps and rods, radius bars, transmission bars and their hangers, links, rockers and rocker shafts, link saddles, bell yoke, dry pipe sleeves, stand pipe, dome caps, pins, bushings, cylinder heads, rocker boxes, throttle boxes, filling blocks, driver brake fulcrum, chafing blocks, combination levers, guide bars and box, reach rods, with some work on the pistons and glands.

Here we have an exemplification of the team work required. The machines of the valve group not only do all the work of that group, but, as they are possessed of some surplus capacity, they also help out other departments that may be temporarily short. Thus the tools of this group comprise plain and crank planers, universal and radius grinders, horizontal and vertical boring mills, plain, vertical and horizontal milling machines, vertical and radial drills, packing and ordinary lathes, a slotter, centering machine and tool grinder. The floor space not only interlocks with the other groups nearby, but includes a space in its center for benches, racks and tables. It is, therefore, a fully equipped machine shop, especially adapted to the particular work for which it is intended. It exemplifies not only a wide departure from, but a close adherence to, the recognized system of tool arrangements. The departure is shown by the fact that instead of sorting and grouping all tools of a kind for the whole shop whereby the lathes, planers, drills, etc., are each placed together, thus separating the several operations on a single piece, they are here scattered among the different groups according to requirements; so that two identical tools may be widely separated because of the different classes of work upon which they may be engaged.

The adherence to the old principle of arrangement is shown by the segregation of the machines in each group, by which the millers, planers and lathes are brought together.

Group No. 3, for brass work, is a simple one, including merely a few turret and ordinary lathes with racks for the holding of the material and finished work.

Group No. 4, for the cylinders and heads, includes a cylinder boring machine, a planer, a vertical boring mill, a radial drill and a tool grinder with provision for the future insertion of a second but smaller radial drill. It is on the opposite side of the shop from the frame group and is served by the corresponding high capacity traveling crane. Here the group is cut down in its allotment of tools, because, as already indicated, a portion of the work can be carried by group No. 2, which is separated from it, physically, by a very short distance.

It was, of course, desirable to locate the heavy cylinder machines well out beneath the crane. This left a vacant space between them and group No. 3, which has been filled by the location of the small group handling the spring and brake rigging where the work is done by drills alone, of which there are three, one being of the radial type.

The irregularity of the floor space of these groups is straightened out by the insertion of the floor for the fitting up of the air pumps, injectors, lubricators, steam gages and other minor and delicate machines. In this the benches are set in line with those in group No. 2 so as to give a symmetry to the shop, and a casual inspection might regard them as one for, of course, there are no partitions to create a physical separation, and the heavy lines on the engraving merely indicate imaginary lines of demarcation.

Extending down the east side of the shop in continuation of the heavy tools in the cylinder department is group No. 10,

which is cut into and divided by the location of a heavy slotter, radial drill and lathe belonging to group No. 13, which handles the heavy forgings. This group, No. 10, does all of the work on the wheels and axles. First there are two boring mills with provision for a third, where wheel centers and similar work is cared for. Then, set somewhat back in the bay, but still served by the heavy crane, are two axle lathes, with two more in the light work bay back of the elevator. All of these tools, it will be seen, are adjacent to the wheel presses, while there is a quartering machine next to the one of 400 tons capacity. The car wheel borer is next the smaller press. This arrangement keeps all of this class to work together and, at the same time, requires the minimum of movement from one tool to the other with an easy and quick delivery of finished parts. Beyond these tools are the two driving wheel lathes and the one for truck and tender work. These might be regarded as a separate department, and wheels on axles can be brought to them without interfering in any way with other tools of the same group.

The group for handling miscellaneous forgings, No. 13, partially surrounds No. 10, so as to throw its heavy machines out under the high capacity machine, while the lighter ones are just within the limits of the light work bay. This group of tools includes radial drills, shapers, lathes, planers and a slotter, and handles the miscellaneous mass of forgings that, while perhaps belonging to specific classes of work, can be more economically dealt with in a single group than by scattering throughout the shop. It is another case of individual tools having too great a capacity to permit being kept exclusively on one job, so that work from a variety of otherwise natural groups can best be brought to them. The same holds for the group of miscellaneous castings. The idea of putting related groups next each other is also shown in Nos. 9 and 15, devoted to shoes and wedges and driving boxes respectively. In the former there are two planers that can be made to supplement or can be supplemented by those intended for driving boxes. In No. 15 there are two planers, one of which is 42 in. by 15 ft., so that the gang planing of boxes can be done, a vertical turret lathe, a radical drill, boring mill, draw shaper, driving box press, tables for assembling and provision for a crank planer. These two groups thus have a clean, self-contained sweep and cover a floor space of 26 ft. by 102 ft., which allows ample room for the storage of material.

Directly in the center of the shop is group No. 23, where pipe work and babbitting is done. The pipe work is, of course, complete in itself and requires simply a cutter and threader to make it independent of its surroundings, but the babbitting department is dependent upon other groups for its work. It is, therefore, made the center of five others, each of which is tributary to it: the groups of driving boxes, pistons, crossheads and rods, while across the central aisle is the floor of the general repair machinists, who will require more or less babbitting to be done in crossheads, rocker boxes, guide boxes, rods and so on. To care for the parts that may be brought in the babbitting department is furnished with racks for holding material. This arrangement of the groups facilitates the delivery of the work, which is brought in and taken away with a minimum of distance to be covered.

These groups are not all, however, complete in themselves. Group No. 16, for pistons and heads, contains a grinder, a lathe, a vertical lathe and a cottering machine, not enough to do all of the work, but we have already seen that a portion of it is cared for in group No. 2, where the lathes and drills of the valve gear group have a surplus of capacity, and which are but a few feet away.

The same statement holds for the crosshead group, No. 17, where the first installation will consist of only a planer and a vertical drill with provision for a horizontal boring mill and access to the cottering machine which stands on the border line between this and the crosshead group. The rod group, No. 19, comes next and covers a large amount of floor space. It has a total length of 152 ft. and a width of 50 ft., but owing to its irregularity of form, where it is encroached upon by other groups, the actual floor area is but 6,300 sq. ft., a fairly good sized shop in itself. The first tools to be installed will be a pneumatic press for rod brasses, a heavy shaper, lathe, two rod millers, a vertical lathe, a vertical miller, vertical drill, double-headed rod borer, slotter and a planer with provision for a second planer, with about half the floor space devoted to racks and benches. The group is not only next the babbitt group, but the general repair machinists.

At one end, back of the wheel group, is that for bolts and studs, No. 22. The machinery will consist of five turret lathes with provision for a sixth, one bolt turner, one bolt pointer, two centering machines, one nut facer, one double bolt cutter and one wet grinder with provision for five bolt lathes. This group has a total length of about 75 ft., of which 20 ft. at one end is occupied by a bolt storage room. The two remaining groups are No. 20 for trucks and No. 21 for pins. They occupy small spaces, and in the former there are one vertical and two radial drills, a vertical lathe and a planer. In the pin group there are one vertical drill and two turret lathes.

This completes the machine shop tool equipment, which is estimated to be sufficient to build four new locomotives and make general repairs on thirty locomotives per month. In addition to the tool equipment there will be two tire floors, each about 30 ft. square, located, as indicated, next the main cross aisle and in the bay for heavy work. One of these floors is next the wheel and axle group, where it would ordinarily be placed, and where the regular work will be done. The other, on the opposite side of the building, will be used as an auxiliary floor, where tires are to be removed or put in position that do not need to go to the wheel lathes. On each side there will also be a large lye pit. These pits will be of sufficient size and depth to permit a pair of drivers on their axle to be submerged and cleaned. They are located in the outer part of the heavy work bay, and are only partially indicated on the engraving.

Outside of these are the erecting bays which extend the length of the shop on either side, but which, falling outside the subject of this article, are merely indicated on the engraving, which does not reach out to the walls of the building.

The tool room has been located at about the center of the building, with the idea that, as the work of the shop increases and the floor area covered by machine tools is extended, it will finally be in a central location relatively to the whole. It is a concrete building, erected at the point located with the tool room on the first floor and toilet rooms above. The equipment will consist of a gear cutter, cutter grinder, reamer grinder, die grinder, two twist drill grinders, a wet grinder, die sharpener, vertical drill, crank planer, universal miller, plain miller, a sensitive drill, a shaper, wet tool grinder and three lathes, with the usual complement of benches and racks.

Separating the machine shop floor from the boiler shop there will be a vacant space of about 120 ft. extending the full width of the building which will be used as an assembly floor for the boiler and other heavy work.

The boiler and tank shop occupies the whole south end of the building for a width of about 125 ft. The tools for the ordinary work are installed in the southwest corner and are adapted for heavy work. They consist of two 60-in. throat punches, and one flange punch, a 30-ft. plate planer, 8-ft. and 15-ft. bending rolls, a four-spindle mud ring drill, a universal sectional flanging press, a flange furnace, a power clamp and straightening block, with a flange fire, an automatic punching and shearing machine, a combination shear and punch, a vertical and radial drill, a set of bevel shears and a tool grinder, with laying-out tables for tank, boiler and firebox work. In the grouping of these tools those for the boiler and firebox work are in the bay for heavy work, while those

for tank work are in the light work bay, but so closely associated as to make the shop a unit.

The shell riveting is done in the southeast corner of the building where there is a 14-ft. gap riveter with an accumulating pump and accumulator to furnish the power needed for operation. The shells are, of course, handled by an overhead crane that is not shown in the drawing. In the engraving, for the purpose of saving space, this riveting floor is shown set in on a line with the machine shop, whereas it really occupies space in the southeast corner of the building on a line with the erecting floor.

From previous articles that have appeared regarding these shops the reader understands that an electric drive is to be used throughout. This layout shows the method of distribution and the location of the motors. It will be seen that a very large proportion of the tools are given an individual drive. This is always the case with the large tools and with many of the smaller ones. In some cases every machine of a group has its individual drive. This is the case, for instance, with the frame group, No. 1; the wheel and axle group, No. 10; cylinders and cylinder heads, No. 4; shoes and wedges, No. 9; crossheads, No. 17; rods, No. 19; trucks, No. 20, and pins, No. 21. In the others there are small group-driven tools where the maximum horsepower developed will be about 20. As far as possible these tools will be arranged in line so that their driving shafts may be connected by clutches, whereby, in the case of the failure of any motor its work can be done by those adjacent to and in line with it. It would be useless and confusing to attempt to catalogue the motors used and their arrangement, but for purposes of reference the engraving will give complete data regarding all motors used and the individual tools or groups to which they will be applied. In this the same care has been exercised as in the selection of the tools, with the result that as far as development of the plans and foresight into the future are concerned the shop layout, as illustrated, is one of the most scientifically executed designs of a shop arrangement that has thus far been brought out.

PENNSYLVANIA RAILROAD SPECIFICATIONS FOR STEEL BOILER TUBES AND SAFE ENDS.

MATERIAL.

(1.) This specification covers cold and hot-drawn and lap-welded steel tubes and safe ends. The material must be open hearth steel. Tubes containing more than .03 per cent. phosphorus or more than .04 per cent. of sulphur will be rejected.

ORDERING.

(2.) Tubes will be ordered in lots of 100 or multiples thereof, and for each 100 ordered, 101 must be furnished.

Safe end material will be ordered as the demands of the service require, and for each 1,000 feet or fraction thereof ordered, two extra feet must be furnished free to test.

In ordering, the outside diameter and thickness must be specified, as per table of weights in section 5 of this specification.

Safe end material will be subjected to the same conditions of marking, inspecting and testing as govern boiler tubes.

MANUFACTURERS' TESTS AND MARKS.

(3.) Before shipping, each seamless tube must be subjected by the manufacturer to an internal hydrostatic pressure of 1,000 pounds per square inch, and lap welded tubes must be subjected to an internal hydrostatic pressure of 750 pounds per square inch.

Each seamless tube must be plainly marked in the middle: "Seamless Steel Tested to 1,000 Pounds Pressure," with the manufacturer's name. Lap welded tubes must be marked "Lap Welded Steel Tested to 750 Pounds Pressure," with the manufacturer's name.

INSPECTION.

(4.) On receipt at the shops, the tubes will be inspected for surface defects. They must have a smooth surface and be free from cracks, blisters, laminations, or pits, both internally and externally, and must also be free from kinks, bends, buckles, or evidence of injury during manufacture. Seamless tubes must be of uniform thickness throughout, and must be round within .020 in., the mean diameter and thickness being within .010 in. of the size ordered. Lap welded tubes must be within .01 in. of the thickness specified except at the weld, where .015 in. additional will be allowed. They must be round within .02 in., and the mean diameter must be within .015 in. of the size ordered. Tubes must not be less than the length ordered, but may exceed it by .125 in.

MINIMUM WEIGHT.

(5.) The minimum weights of various diameters and thicknesses, which will be accepted, are as follows:

Outside diameter.	Thickness, ins. .095-in.	.110-in.	.120-in.	.125-in.	.134-in.	.150-in.
1.75 in.	1.63 lbs.	1.87 lbs.	2.03 lbs.	2.11 lbs.	2.25 lbs.	2.49 lbs.
2.00 "	1.87 "	2.15 "	2.34 "	2.43 "	2.59 "	2.87 "
2.25 "	2.12 "	2.44 "	2.65 "	2.75 "	2.94 "	3.26 "
2.50 "	2.37 "	2.73 "	2.96 "	3.08 "	3.29 "	3.65 "
3.00 "	2.86 "	3.29 "	3.58 "	3.72 "	3.98 "	4.43 "
3.50 "	3.35 "	3.86 "	4.21 "	4.37 "	4.68 "	5.21 "
4.00 "	3.85 "	4.44 "	4.83 "	5.02 "	5.37 "	5.98 "

STORING.

(6.) On receipt at the shops, the tubes will be piled in lots of 101 and safe ends in lots of 1,000 feet. Each lot will be tagged with the requisition number, lot number and name of manufacturer; one lot to be used for each 101 tubes, and one lot for each 1,000 feet of safe end material. No lot of tubes shall be used until the results of test are known.

SAMPLING.

One tube from each lot will be selected at random, and a piece 24 inches long must be cut from it and stamped with the manufacturer's name, together with the designating requisition and lot numbers of the lot to which it belongs. The remaining portion of the tubes from which the test pieces were taken, must be preserved until test report is received.

Sample tubes will be properly tagged, tag giving the same information as stamped on the samples, which will then be shipped to Engineer of Tests, Altoona, Pa., where they will be subjected to the following tests:

EXPANDING TESTS.

(7.) A section of the tube 12 inches long must expand cold to 1 1-6 times its original diameter without splitting or cracking; the expansion to be obtained by forcing the small end of a tool steel pin, tapered 1½ in. to the foot, into the tube by means of light blows with a ten-pound hammer, or by a suitable press or expanding machine. In making this test, care must be taken to have the end of the tube smoothly trimmed.

CRUSHING TEST.

(8.) A section of the tube 2½ in. long placed vertically shall crush cold, flat on itself without splitting or cracking in any direction. This crushing test may be made by placing the tube vertically on the anvil of a steam hammer and subjecting it to a series of light blows, or it may be made in a suitable quick-acting hydraulic press. Light surface cracks on the outside of the bend will not be considered as condemning cracks, and one or two surface cracks shall not be considered as a failure, but if the cracks are more numerous, or if they penetrate, the tube will be considered to have failed on this test.

FLATTENING TEST.

(9.) A test piece of tube 6 inches long, when flattened cold sideways, flat on itself, must not show any splits or cracks.

ETCHING AND NICKING TESTS.

(10.) Etching and nicking tests will be made in case of doubt as to the quality of the material in the tube after the

various tests have been made. The etching test must show a perfectly homogeneous surface, and the nicking test must not disclose laminations or any seam or cavity longer than ¼ of an inch.

REJECTION.

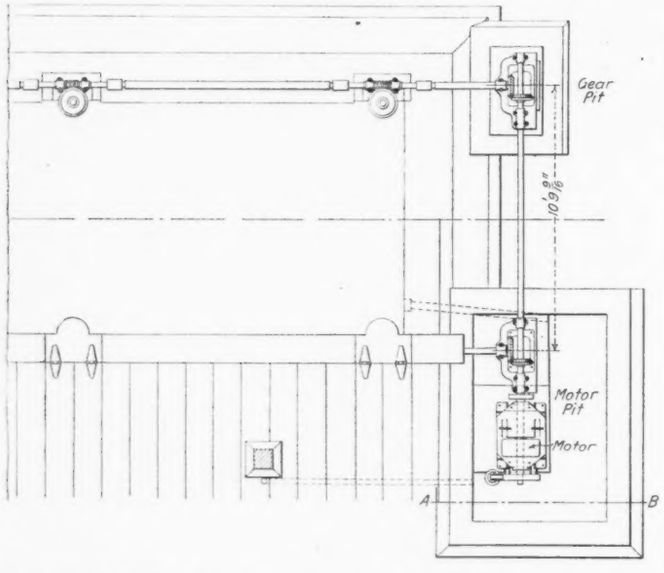
(11.) In order that any shipment from one manufacturer shall be accepted, it is required that 75 per cent. of the samples from such shipment shall pass the above described tests without question. If the other 25 per cent. show results close to the requirements, shipments may be accepted at the option of the company. All tubes and safe ends are subject to the conditions of paragraph 12.

(12.) In adition to the above tests, individual tubes, which, when being inserted in the boiler, split or break, while being expanded or beaded, and also individual tubes which fail to pass the surface inspection, will be rejected.

(13.) Rejected tubes and safe end material will be returned to the manufacturer, who must pay freight charges both ways. The test samples representing the rejected tubes or safe ends will be preserved at the test room one month from date of test report. Accordingly, in case of dissatisfaction with the results of test, manufacturers must make claim for a rehearing, should they desire to do so within that time. Failure to raise a question for one month will be construed as evidence of satisfaction with the tests, the samples will be scrapped, and no claim for rehearing will be considered.

DESIGN OF ENGINE DROP PIT AND TABLE IN ROUNDHOUSE OF THE CENTRAL OF GEORGIA.

Engine drop pits and tables of the design here shown, with the exception of the motor drive, are in use in the Lehigh Valley shops at Easton and Wilkes-Barre, Pa., and in the old shops at Sayre, Pa. At Easton, the table is driven direct from a small stationary engine, and at Wilkes-Barre and Sayre it is driven from the shop line shafts. There are also,

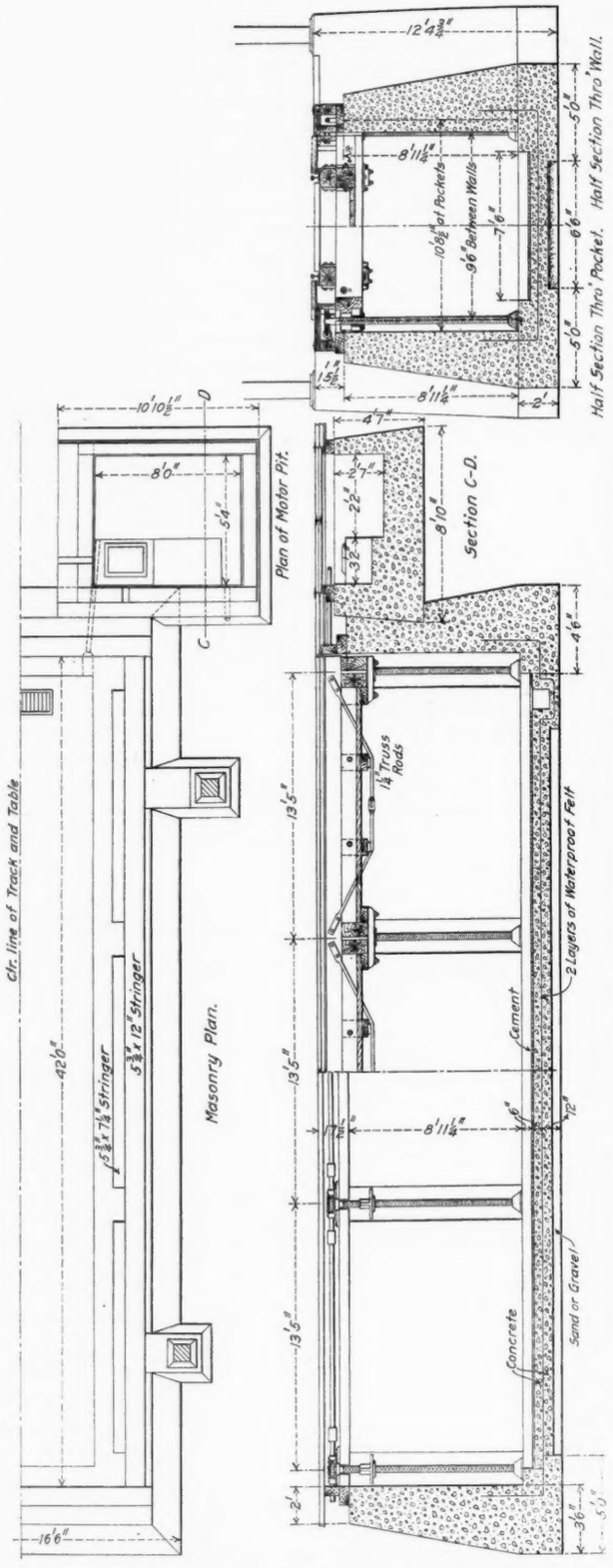


Part Plan of Driving Arrangement of Drop Pit and Table.

on the Reading, installations of this same design, with motor drive. One of these is located at the Reading, Pa., shops, two at Port Richmond, one at Tamaqua, Pa., and one at Rutherford, Pa. One of these drop pits has also recently been installed, with motor drive, in the roundhouse of the new shops of the Central of Georgia at Macon, a description of which shops appears in this issue.

This type of drop table is superior to a bridge, in that all of the working parts are below the floor level and out of the way, and do not encroach upon the working space of the shop proper to as great an extent as does a bridge. It is generally desirable, in connection with these tables, to have either an air hoist or a monorail electric crane to pick the wheels out of the pit and place them directly on the driving wheel lathe.

When the operators have become familiar with handling this



Engine Drop Pit and Table in Roundhouse of Central of Georgia Shops; Macon, Ga.

table very rapid work can be done in dropping wheels and re-wheeling locomotives. In large shops where overhead cranes may be used, these pits and tables would not be considered, but in small shops they are the best arrangement where crane service is not available.

We are indebted to F. F. Gaines, superintendent of motive power, Central of Georgia, for the data and drawings given.

General News Section.

The Georgia Railroad is to introduce telephones for train despatching on the main line and the Macon branch, 42 stations.

Train auditors are now employed on the passenger trains of the Texas & Pacific running into Marshall, Tex. They have been employed for some time on certain other runs.

Three cents is said to be the fare now on seven street car lines in Cleveland, Ohio. The franchises of these lines expired January 25, but the fare was voluntarily reduced by the companies on that day from five cents to three cents.

The St. Louis *Globe-Democrat* says that the western railways entering St. Louis are considering a plan for the establishing a union city ticket office, owing to the high rents that are being asked for the renewal of leases in desirable locations.

The New York Up-State Public Service Commission has approved a plan, suggested by certain property owners in Brooklyn, for the construction of an extension of a subway in Livonia avenue, Brooklyn, by assessing the cost on the real estate, adjacent and nearby, which is to be benefited in value by the construction of the line.

According to a Pennsylvania paper, a trainmaster of the Philadelphia & Reading has been obliged to issue a notice forbidding the use of "Pennsylvania Dutch" in issuing orders to men on or about trains, misunderstandings having caused trouble. It was generally reported that this reform of language was decreed several years ago. Evidently the men do not stay reformed.

A report of the ship building industry of the United States for the year 1909 shows a total tonnage built of 281,271; and of this 31 per cent., or 87,951 tons, was built by the American Shipbuilding Company (on the lakes). There has been an enormous increase in traffic on the great lakes, and the American has so many orders ahead that it is receiving premiums for prompt execution.

April 1 is the day now announced as that on which trains on the Long Island Railroad will run through the Pennsylvania tunnel to the new terminal at Seventh avenue, Manhattan, New York. From this terminal trains will run to all points on the Long Island to which the electrified lines extend. Not until June or later will trains from New Jersey run to the Manhattan terminal.

The railways of Indiana have asked the state railway commission for a rehearing on the commission's order requiring the installation of headlights of 1,500 candle power or more on all passenger and freight engines. The petition states that the railways have additional evidence that they desire to place before the commission. It also states that the orders entered preclude the use of acetylene lights and restrict the roads to the use of electricity.

According to the *Providence Journal*, recent examinations by the federal civil service boards, in that city and Boston, of candidates for the position of examiner of railway accounts for the Interstate Commerce Commission, resulted in the rejection of all the candidates; and it is reported that there were similar failures at many other cities where examinations were given. The commission wants 105 examiners, but it is said that the test was a very "stiff" one.

A newspaper despatch from Mexico City says: "The demands made upon the management of the National Railways by the American engineers and conductors are to the effect that employees retained shall be competent to the end that danger to train crews and to the public may be eliminated as far as possible. The men have asked that at least 50 per cent. of engineers and conductors to be hired in the future shall have had actual experience in the line of the duties they are to perform, leaving not a larger proportion than 50 per cent. to be advanced from subordinate service. The question of nationality is said not to have figured in the negotiations.

The trustees of the Pennsylvania State College have decided that the college, in connection with the Pennsylvania Railroad, shall establish a college for apprentices in the mechanical department of the Pennsylvania shops at Altoona. The school will begin with 30 students from the four-year apprentices at the shops. It will be started about the middle of February and continued for three and one-half months. Instruction is to be given two afternoons each week.

The American Express Co. on April 1 will begin operation on the lines of the Union Pacific, the Oregon Short Line, the Oregon Railroad & Navigation Co. and the San Pedro, Los Angeles & Salt Lake. This will add a total of 7,000 miles to the operated mileage of the American Express Co., this new mileage previously having been operated by the Pacific Express Co. It is said that this change is due to the fact that the Pacific Express Co. is to operate over the Western Pacific.

A press despatch from the City of Mexico states that the management of the National Railways of Mexico has notified the joint committee of American conductors and engineers that the demands which it has made will not be granted. The men had been told that they would be treated fairly and that only in cases where applicants for positions or promotions were of equal merit will preference be given to Mexicans over Americans. The American employees ask that the unions be given the right to appoint two men on the examining boards to the railway's one. This was flatly refused. Officers of the railway say they hope the statement of its position will prove satisfactory to the employees. If it does not it is intimated that unionism on the Mexican lines will be ended, as the roads would prefer to operate with reduced forces until they can import non-union men or train native Mexicans to fill positions, rather than be dictated to by labor unions.

The monthly financial report of the Atchison, Topeka & Santa Fe for December, 1909, shows that this road's operating expenses during December were $1,371,016 larger than during the same month of 1908, while its gross operating revenue increased only $221,696. The very large increase in operating expenses is attributed to the abnormally severe weather in December, and when the figures are available it is probable that similar increases in expenses will be disclosed on other roads. A circumstance which also tended to increase operating expenses much more than gross earnings was that the severe weather caused a very large increase in the movement of coal, which, while it increased expenses substantially as much as corresponding increases of other traffic would have done, did not yield as great an increase in the revenue owing to the relatively low rates on coal.

A bill has been introduced in the New York legislature to carry out the recommendation of the State Public Service Commission, Second District, that railways be required to publish their time tables in local newspapers. In first and second-class cities the commission shall designate the papers; in smaller places the time tables must be printed in all newspapers of general circulation. The penalty for violation is $25 a day. The bill, as drafted, also requires complete time tables to be posted both in passenger and in freight stations, showing all trains stopping at such station, which evidently would include local freights; and empowers the commission to excuse a road from publishing in a village paper of small circulation. It may excuse also in case a paper charges higher than its minimum rate for general advertisements occupying the same space. The intent of the law seems to be to require the publication of time tables in the same manner as was formerly common; that is to say, a list of trains in each direction with their principal destinations.

The Postal Telegraph Company.*

In 1881, the Western Union Telegraph Company, under the leadership of Jay Gould, acquired control of all the commercial telegraph lines in the United States. The smaller companies that had previously been built up had proved unprofitable and impossible of permanent maintenance, every one of them having been founded upon mistaken notions of living on local business and of various so-called improvements in methods of transmission, reduced rates, rebates and other forms of bidding for business, which soon proved to be ruinous. It was a common belief that competition in the business was at an end, but the demand for competition resulted in building up between the years 1881 and 1885 a more extensive, diverse and damaging competition than had ever before existed. The "Mutual Union," the "American Rapid," the "Bankers & Merchants," the "Baltimore & Ohio," the "Southern," the "Board of Trade," the "Pacific Mutual," and the original "Postal" were formed, and all were competing with each other as well as with the Western Union in the most wasteful manner.

In this chaotic condition my father, John W. Mackay, came into the control of the property bearing the "Postal" name. He built rapidly and built good lines in all directions. The Postal Company was organized in 1886 and immediately began to build telegraph lines and also purchase various lines which had become insolvent. The Postal began a stormy existence by being met with a war of telegraph rates. Prior to its entry into the telegraph field, the rates were very high. The following table speaks for itself:

	Rate	
	Old.	Present.
New York and Arkansas.....	$1.00	$0.60
" " " California	1.50	1.00
" " " Colorado	1.25	.75
" " " Kansas	1.00	.60
" " " Montana	1.50	.75
" " " North Carolina	.75	.50

[Other states proportionately reduced.]

It has been necessary to maintain the corporations of which ownership was acquired, as separate corporate entities, and to form new corporations in States where the property was not already owned by a local corporation, and to have each company own and operate the property in the State in which it is organized. This policy has been necessary for a number of reasons, among them being that new telegraph companies were obliged to build their lines on highways (the Western Union having practically monopolized the rights of way along railways under exclusive contracts with railways), and were frequently compelled to condemn rights of way. In many States city ordinances are granted only to domestic corporations, and only domestic corporations may condemn rights of way. It was necessary to incorporate five companies in building a line from Denver westward, in Colorado, Wyoming, Montana, Idaho and Utah. * * * The percentage of tolls going to each company handling inter-state business must vary, because the cost of handling business varies. The expense of maintaining lines in what is known as the "sleet belt," around Chicago and Buffalo, is very high compared with the expense of maintaining lines in other sections where sleet is unusual or unknown. The Postal Company has been free and independent from the time of its organization in 1886 and proposes to remain so. It has not the slightest influence or control over the American Telephone & Telegraph Company, or the Western Union Telegraph Company. It took no part in the recent purchase of the Western Union by the American Telephone & Telegraph Company, and was not consulted and knew nothing about it until after it had been accomplished. We shall not take part in the combination and we feel confident that we shall be able to retain our telegraph business, and even to increase it gradually, by extensions and by good service. We have great trouble in obtaining rights of way on railways over the pathless deserts of the West, where there are no highways on which to erect our lines. However, we are gradually forcing our way, and during this past fall we built an entirely new pole line on a new route from Sacramento, California, to Reno, Nevada, crossing the Sierra Nevada mountains, and for many months past we have been trying to make progress in condemnation proceedings to acquire a right of way eastward from Reno to Salt Lake City.

We are no longer seeking the old-time contract with railway companies, under which the telegraph company furnished everything, and received little or nothing, outside of a right of way, in return; and we find that our freedom from those contracts enables us to keep our wires free from the great burden of railway deadhead business. But we are seeking, and we are making from time to time, what we call "connecting line" arrangements with railway companies, where, under joint and equitable arrangements for exchange of traffic, we are able to extend our service into remote sections of the country. If the Postal Company were united with the Telephone and Western Union there would never be another competing telegraph company, because no telegraph company can succeed unless it reaches every State and every important city and town, and not only would that require a vast sum of money but it would be physically impossible, inasmuch as in many of the great cities there is no room left in and under the important streets, and entrance could not be obtained. Between many of the important commercial centers, as for instance, between New York and Philadelphia, it is impossible now to find another right of way on the highways for a through line. The Postal Telegraph Company will be the last competitor in telegraphy, and when that competition ceases there will be a choice only between monopoly and Government ownership.

We claim that we are giving the fastest and best telegraph service ever given in the world. Good telegraph service is given in some parts of Europe, but in Great Britain there is a large deficit each year in the Government telegraph service, which the Government has to pay. We have increased the efficiency of our staff, and except in time of storm or stress we are handling messages from customer to customer, between all important points in 20 minutes, and as a rule, we make even better time. We are giving this fast service between all the larger commercial centers and are extending it further. This very fast service has improved wonderfully the service to the smaller places. It costs much more than what the service cost a year ago. We are satisfied that we can continue it, however, and intend to do so. We attach as closely as possible to the company the loyalty and enthusiasm of the army of employees by an Employees' Association, the unique and essential features of which are that there are no dues to be paid by the employees, and no debts are to be incurred. The company itself pays to the members of the association or their beneficiaries, certain cash allowances in case of their sickness or death. Pratically all of our employees have become members of the association. The plan is a new one in many of its features, and has worked harmoniously and to the great satisfaction of the employees and of the company.

We have no objection to being placed under the Public Service Commission if that is desired by the State; but about seven-eighths of the telegraph business of New York State is inter-state, over which, I suppose, the Public Service Commission would have no jurisdiction. Nevertheless, if the State desires it, we have no objection.

*Extracts from the testimony of Clarence H. Mackay, January 21, before a committee of the New York Legislature.

Increase of Pay.

The Interborough Rapid Transit Company, operating the subway and elevated railways in Manhattan, New York City, has advanced the pay of its employees, beginning February 1, in the gross sum of $160,000 a year. Trainmen and stationmen receive increases in most cases of 10 cents a day. The directors are considering the question of establishing a pension system.

The Philadelphia & Reading has increased the wages of enginemen, beginning February 1, to the basis in vogue on the other principal roads of the country. The increase will average about 13 per cent., and about 12,000 men will be affected.

Pennsylvania papers report Vice-President Voorhees, of the Reading, as saying that increases in pay are soon to be announced for conductors and brakemen, as well as enginemen. There has been no formal demand on this road through the Brotherhood of Trainmen. One report says that the increase

for conductors and brakemen will apply only in the anthracite coal districts.

Increases of five to ten cents an hour have been made by the Delaware, Lackawanna & Western in the pay of 1,500 to 2,000 men in the shops of the company at Scranton.

Representatives of the Brotherhood of Railroad Trainmen have held conferences this week with officers of the Grand Trunk, the Canadian Pacific, the Baltimore & Ohio and the New York Central. It is said that the leaders of the enginemen's and trainmen's brotherhoods are making a strenuous effort to get the eastern roads to establish a committee to deal with the chief officers of the brotherhoods instead of carrying out the purpose, expressed by some of the roads, to deal only with separate committees on each railway. One brotherhood representative tells a reporter that they are going to strive to get the eastern roads to pay uniform rates, as is done by the roads in the West. The situation in the East, where certain roads pay higher wages than certain others, is very annoying to this representative.

Railway Matters in Washington.

The House Committee on Monday gave a hearing to J. C. Lincoln, of St. Louis, on the clause in the pending bills imposing a penalty on a railway where a freight agent quotes a rate to a shipper incorrectly. Mr. Lincoln presented a mass of testimony to show the extent of the inconvenience suffered by shippers on account of erroneous rate quotations.

President Taft, acting on a voluminous report made to him by the attorney-general, has decided to press the suit of the government against the Union and the Southern Pacific to condemn their joint control as illegal. The goverment has finished presenting its testimony in this case, and the defense will begin presenting evidence in April. The suit was begun in the federal court in Utah, but will go to a special tribunal of four judges, as provided for by the Anti-trust Act.

The Senate Committee will hold hearings on the railway bills this week Friday and Saturday, but sentiment among both senators and representatives appears still to be in a nebulous state. No announcement has yet been made as to who will be first heard at the hearing; but large numbers of railway men are in the city.

Moral Standards of a Railway Officer.

"The railway lobbyist (using the term in its offensive sense) is a thing of the past. The designation, once a term of reproach, will in the future be proudly borne by thousands of men who will represent sturdily the rights of their properties before the assemblies of the people's elect, and who will, I am serenely confident, command respect and attention in the degree that they respect themselves.

"Years of right dealing in this respect alone can rehabilitate the railways in the public estimation, but there can be no doubt that this will be done. A far-sighted railway official to-day desires nothing more earnestly than a square accounting with its vast clientele—the public—and the honest and efficient administration of laws which protect as well as punish. Measured by correct political standards, the railway man of the past has not risen to his opportunities.

"Every employing official ought to feel the great responsibility that inevitably goes with the selection of men. Perfection in this will never be attained, but should be always sought. The men who never make mistakes are those who attempt nothing.

"Careful selections are oftentimes thwarted by conditions which could not have been humanly foreseen, and it should comfort that employer, smarting under a particularly aggravating failure in this respect, that the First Gentleman of the World, the Saviour of mankind, was similarly afflicted in His chosen twelve.

"There is not a railway employee who has not his circle of influence and in which his railway is good or bad as he reflects those attributes in his daily life. It is a historical fact that enduring success cannot be attained by any cause to which wrong attaches. It remains, therefore, that to secure respect (for with respect will come the kindred attributes of regard and affection) the railway man of the present and future must so conduct himself as to silence doubt, confute slander, and, walking as he does in the full noon of public knowledge, justify by his private and official life the fullest confidence in the probity and morality of his official motives, and then—and not until then—will he be taken at his own estimation of himself."—*C. R. Gray* (St. L. & S. F.) before St. Louis Railway Club.

Eight Passengers Killed at Stoats Nest, England.

Press despatches of Saturday last report the derailment of an express train on the London, Brighton & South Coast at Stoats Nest, near London, on that day, in which eight passengers were killed and about 30 injured. The train, which was from Brighton, bound for London, was passing the station at about 40 miles an hour when two third-class carriages were wrecked and thrown against the station, knocking down a part of that structure, and a Pullman parlor car was thrown high up in the air so that it fell partly on the station. There is no clear account of the cause of the derailment. One statement seems to indicate that the trouble was at a switch, while another says that a coupling broke.

The Proposed Hudson River Bridge.

The Interstate Bridge Commission of the state of New York, appointed in 1906 to act jointly with a commission of the state of New Jersey, in considering the project for a bridge across the North river at New York City, has made its third annual report, recommending that a bridge be built at One Hundred and Seventy-ninth street. This is about six miles north of Sixtieth street, the point which has been the New York terminus most frequently considered in previous proposals. At One Hundred and Seventy-ninth street there is high rocky land on both sides of the river. The main span would not have to be over 1,400 ft. long and no long approaches would be necessary. The estimated cost is $10,000,000 for a bridge to carry a highway and to carry trolley cars at high speed. It is estimated that at any point farther south the cost would be three times as much, and a crossing farther north would be out of the question on account of the increased width of the river. West One Hundred and Seventy-ninth street is nearly on a line with the Washington bridge across the Harlem river.

International Asbestos Association.

The International Asbestos Association was recently organized at a meeting held in New York. Its membership is composed of representatives of American and Canadian mine owners and manufacturers. Included in the association are the largest producers and users of asbestos in the United States and Canada, among them the Amalgamated Asbestos Corporation, Ltd., Keasbey & Mattison Co., Philip Carey Mfg. Co., Asbestos Protected Metal Co., Franklin Mfg. Co., H. W. Johns-Manville Co., Sall Mt. Asbestos Mfg. Co., Ling Asbestos Co. and the United States Asbestos Co. The following were elected officers of the association: T. F. Manville, president; R. V. Mattison, Jr., vice-president; R. P. Doucet, secretary.

It is announced that the purposes of the association are the general exploitation of the uses of asbestos, particularly in the field of fireproof construction, cooperation between consumer and producer, cultivation of new markets, and development of processes whereby the wastes in the industry may be rendered commercially valuable. The association will establish a bureau that will be devoted to the aforementioned purposes.

Omaha Railway Club.

D. C. Buell, educational director of the Harriman Lines, has been elected a director of the Omaha Railway Club, vice R. E. Hayward (C. B. & Q.), resigned. The club will have regular meetings at its rooms in the Barker block on the second Wednesday of each month. It will have as guests at its meeting on February 9 those attending the meeting of the Trans-Missouri Freight Association, which will be held in Omaha on February 8 and 9. W. E. Bock (C., M. & St. P.) has been elected treasurer of the club.

American Society of Mechanical Engineers.

The New York monthly meeting for February will be devoted to the dedication of a bronze memorial tablet to Dr. Robert H. Thurston, the first president of the society. All associates and former students of Dr. Thurston are earnestly invited to attend these exercises to show their esteem for him as a friend and in recognition of his brilliant career as an engineer and educator.

Addresses will be given upon Dr. Thurston as a man, and his life work, by speakers of wide reputation who knew him intimately. These addresses will touch upon his experience as an engineer of the navy during the Civil War; his work as an educator at Stevens Institute of Technology and at Cornell University; his achievements as engineer and investigator; as an author; and his long relationship with the society.

Among those who will participate are Prof. John E. Sweet; Col. E. A. Stevens; President J. G. Schurman of Cornell University; Prof. Albert W. Smith, and Mr. William Kent, consulting engineer. It is expected that Mrs. Thurston will attend. Dr. Alex. C. Humphreys, president of Stevens Institute, will be the chairman.

The beautiful memorial which is to be unveiled is the work of Herman H. McNeil, a former student and personal friend of Dr. Thurston. It is a replica of the memorial tablet presented to Sibley College, Cornell University, by alumni and students of the university. The tablet was placed in the rooms of the society through the generosity of members and their devotion to Dr. Thurston.

Robert Henry Thurston was born in Providence, R. I., in 1839 and died in 1903. His father, Robert L. Thurston, as partner with John Babcock in 1834, formed the Providence Steam Engine Co., the first steam engine establishment in New England. Robert H. Thurston thus inherited his mechanical tastes. He graduated from Brown University and later received advanced degrees as the result both of study and of his accomplishments as a teacher and engineer. He was an engineer in the United States Navy, professor of mechanical engineering at Stevens Institute, director of Sibley College, the first president of The American Society of Mechanical Engineers, at various times a member of boards of engineers and committees, government representative and a recipient of other important appointments. He conducted extensive research work of lasting value, was prominent in many engineering and scientific societies and was an author of world wide reputation whose works included many of the best known text books and a large number of papers and memoirs contributed to this and other societies.

American Society of Civil Engineers.

At the meeting held on February 2, 1910, two papers were presented for discussion as follows: "Underpinning the Cambridge Building, New York City," by T. Kennard Thomson, M. Am. Soc. C. E., and "Building Agreements," by William B. Bamford, Assoc. M. Am. Soc. C. E. Both of these papers were printed in Proceedings for December, 1909.

Bureau of Explosives.

A meeting of the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles will be held in New York City, February 24, to take the place of the fourth annual meeting, the date of which was February 1.

American Railway Association.

At a special session of this association held in New York, January 27, resolutions were adopted making the National car demurrage rules, adopted by the state railway commissioners at Washington last autumn, the rules of the A. R. A.; and requesting members of the association to furnish copies of instructions which they issue to their agents in connection with the new rules. The committee on relations between railways will undertake to formulate a uniform set of instructions to agents.

At the same meeting it was resolved to at once take a letter ballot, to be closed February 19, on the adoption of two per diem rates for freight cars; 30 cents a day for March, April, May, June and July, and 35 cents for the remaining seven months of the year. The vote is to be taken under the same conditions as that of last year; namely, to adopt the resolution there must be the votes of a majority of the members, controlling two-thirds of the cars.

General Managers' Association of New York.

J. C. Stuart, vice-president and general manager of the Erie, has been made chairman of the General Managers' Association of New York, succeeding W. G. Besler.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; June, 1910; Niagara Falls, Ont.

American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Penna. Co., Toledo, Ohio.

American Ass'n of Railroad Superintendents.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; March 18; Chicago.

American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York; March 30-April 1; Charlotte, N. C.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 18; New York.

American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.

American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago, March 14-17, 1910; Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.

American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.

Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.

Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May; Nashville, Tenn.

Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, N. Y.

Buffalo Transportation Club.—J. N. Sells, Buffalo.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.

Northern Railway Club.—Fourth Saturday in month; Duluth, Minn.

Omaha Railway Club.—A. H. Christiansen, Barker Blk.; 2d Wednesday in month.

Railroad Club of Kansas City.—Third Friday in month; Kansas City.

Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.: 4th Friday in month, except June, July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.

Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

Society of Railway Financial Officers.—C. Norquist, Chicago.

Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.

Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

Traffic Club of New York.—C. A. Swope.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.

Western Canada Railway Club.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Monday, except June, July and August; Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

Reporters in New York gather that at a meeting of the Trunk lines this week the Erie and the Lackawanna were induced to refrain from reducing freight rates to the West on April 1, as they have said they would do.

At its recent meeting in Chicago the Transcontinental Passenger Association considered the subjects of summer tourist, home seekers' and colonist rates. No change will be made from the rates of last year. The summer tourist rates will remain on the basis of $72.50 for the round trip from Chicago to the Pacific coast, and the one-way colonist rate will be $33.

S. S. Pratt, secretary of the Chamber of Commerce of New York City, reports that the vessel tonnage entering the port of New York in the foreign trade in the year 1908 amounted to 12,154,780 net registered tons. This is claimed to be larger than the movement of vessels in the foreign trade at any other port in the world, Antwerp coming second, London third and Hamburg fourth. The increase at New York in ten years was 56.4 per cent.

The Iowa Commercial Coal Association has petitioned the Iowa Railway Commission to reduce the rates on coal in Iowa. Its petition states that the coal mined within the state is transported under the Iowa distance tariff, which was established over 20 years ago. It is alleged that this tariff is unreasonable and excessive and is higher than rates for like service voluntarily made by the railways, in consequence of which coal mined outside of Iowa is shipped into the state at lower rates, and sold with more profit to the producers, than coal mined in Iowa. The commission has set a hearing on the subject for March 9.

Westbound Trunk Line Shipments.

According to figures printed in the *Wall Street Journal*, the New York, Ontario & Western has, during the past year, made a marked increase in its westbound freight shipments at the expense of its competitors. In December, 1908, the Pennsylvania carried 23.4 per cent. of the total westbound tonnage forwarded from New York by nine standard lines. In December, 1909, this was reduced to 19.6 per cent. On the other hand, Baltimore & Ohio increased from 8.0 per cent. in 1908 to 9.7 per cent. in 1909; New York, Ontario & Western from 5.8 per cent. in 1908 to 7.6 per cent. in 1909, and the Lehigh Valley from 13.8 per cent. to 14.1 per cent. For the full 12 months the figures are as below.

The New York, Ontario & Western's tonnage increased from 83,884 tons in 1908 to 158,730 tons in 1909, an increase of 89.2 per cent. It is said that the other standard lines have forced the Ontario to agree to the elimination of its differential and that hereafter it will be on the same footing as the other all rail lines.

The total westbound tonnage, all classes, forwarded from New York by nine standard lines, and the proportion to the whole which each carried in the month of December and in the year ending December 31, were as follows:

Month of December.

	1909		1908	
	Tons.	Per cent.	Tons.	Per cent.
Pennsylvania	28,674	19.6	29,645	23.4
New York Central	25,352	17.3	21,815	17.3
Erie	16,133	11.0	13,714	10.8
Baltimore & Ohio	14,103	9.7	10,176	8.0
West Shore	8,237	5.6	7,141	5.7
Lackawanna	18,529	12.7	16,046	12.7
Lehigh Valley	20,547	14.1	17,511	13.8
N. Y., Ont. & Western	11,077	7.6	7,275	5.8
Central of New Jersey	3,474	2.4	3,191	2.5
Total	146,126	100.0	126,514	100.0
For the Year.				
Pennsylvania	353,928	18.9	305,769	19.0
New York Central	334,415	17.9	297,503	18.5
Erie	232,245	12.4	211,728	13.1
Baltimore & Ohio	151,977	8.1	118,384	7.3
West Shore	108,208	5.8	114,326	7.1
Lackawanna	243,900	13.0	233,570	14.5
Lehigh Valley	240,399	12.8	209,121	13.0
N. Y., Ont. & Western	158,730	8.5	83,884	5.2
Central of New Jersey	49,490	2.6	37,556	2.3
Total	1,873,292	100.0	1,611,841	100.0

December's total westbound tonnage carried by the nine roads increased 15.5 per cent. over 1908. Trunk line traffic men say that up to the third week of January indications point to business for the entire month in as large a volume as was reported for December.

Exports of Farm Products from 1851 to 1908.

A report on the annual exports of farm products from the United States from 1851 to 1908, inclusive, about to be published by the department of agriculture, shows that in 1851-1855 the average value per capita of the agricultural exports of the United States was $5.85, in 1901-1905 it was $10.88, and since 1905 it has been still greater. The chief agricultural products exported in the past half century have been cotton, grain and grain products, and packing-house products.

In 1851-1855 cotton made nearly two-thirds of the value of all agricultural exports, but in 1901-1905 between one-third and one-half only, although the average quantity exported increased from 1,026,000,000 lbs. in 1851-1855 to 3,577,000,000 lbs. in 1901-1905, while in 1907 the maximum of 4,518,000,000 lbs. were sent out. In quantity exported per capita, the five-year period 1856-1860 was highest; there were then exported 44.8 lbs. of cotton per capita. The nearest approach to this was 44.5 lbs. per capita in 1901-1905. Cotton-seed products, such as cotton-seed oil, oil cake and oil-cake meal have assumed considerable importance in the export trade of the United States in recent years, that is, beginning about 1876. The value of cotton-seed products exported averaged during the past several years from $25,000,000 to $30,000,000 a year, the highest being in 1907, about $34,000,000.

Grain and its products come second in order of value. They increased from a yearly average of $25,000,000 in 1851-1855 to $194,000,000 in 1901-1905, and in 1908 were $215,000,000. The period of largest grain exports was 1896-1900, since which time there has been a decline. The per capita exports of wheat and flour were largest in 1881-1885, when they were equivalent to 2.6 bu. per capita; in 1901-1905 the average exports per capita were 2 bu., and since 1905 have been less than 2 bu. In corn the maximum limit was reached in 1896-1900, when an average of 2.4 bu. per capita was exported.

Exports of packing-house products have increased much more rapidly in the last half century than cotton or cereals. The average value of packing-house products exported in 1851-1855 was $10,000,000 a year, and in 1901-1905 it was $183,000,000, while in 1908 the value was $196,000,000. The principal items of this group are pork, lard, beef and oleo oil.

The largest exports of beef and oleo oil (those in 1901-1905) amounted to 408,000,000 lbs. a year for beef and 146,000,000 lbs. for oleo oil. Since 1905 there has been a marked decline in exports of beef, the average for 1906-1908 being only 349,000,000 lbs. a year, or less than for any five-year period since 1886-1890. On the other hand the average exports of oleo oil during the three years ending with 1908 exceeded the average for 1901-1905 by nearly 60,000,000 lbs.

Tobacco, which a century ago was among the most important of our exports, still holds a prominent place. Exports of unmanufactured tobacco have averaged since 1891-1895 more than 300,000,000 lbs. a year, with an average yearly valuation of about $30,000,000. The per capita exports of this product declined from 5.3 lbs. in 1851-1855 to 4.1 lbs. in 1901-1905, while during 1906-1908 the average was less than 4 lbs.

The value of exports of fruits increased from $71,000 in 1851 to $20,000,000 in 1904, and subsequently ranged from $14,000,000 to $17,000,000.

The Potato Limited.

Officers of the Oregon Short Line have recently made a triumphal tour through northern Utah and south Idaho with a potato and soil special; in other words, a farmers' instruction train in which the lecturer dealt chiefly with the art of growing potatoes. Previous to the trip the general passenger agent had offered $500 in prizes for the four best exhibits of potato fields of one-fourth acre, one-half acre, one acre and five acres. Last year 1,731 cars of potatoes were shipped out of Idaho, 309 of which went as far as Texas and 303 to Missouri and points east of there.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1909.

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	142	$100,203	$48,027	$158,130	$19,448	$22,987	$3,902	$44,254	$5,392	$95,983	$62,147	.....	$4,901	$57,246	$13,550
Arizona & New Mexico	108	67,054	6,761	75,538	13,964	4,059	165	12,521	1,605	32,314	43,224	.....	2,583	40,641	—13,095
Bangor & Aroostook	546*	159,085	49,944	220,436	36,387	26,857	3,141	66,834	10,717	143,936	76,500	.....	1,500	75,000	15,664
Bessemer & Lake Erie	201	342,527	22,236	374,104	70,286	85,391	8,813	127,483	32,968	324,941	49,163	.....	44,210	4,953	—4,437
Buffalo, Rochester & Pittsburgh	567	601,950	78,242	701,834	53,175	153,234	9,293	210,368	13,859	439,929	261,905	$842	13,000	248,947	77,980
Central New England	278	204,886	26,919	247,196	47,425	22,058	1,805	75,646	2,951	149,885	97,311	.....	6,500	90,811	10,584
Chicago & Eastern Illinois	965	840,443	155,946	1,046,620	95,982	195,053	20,914	384,929	34,108	730,986	315,634	—1,284	20,041	294,309	3,786
Chicago Great Western R.R.	1,486†	599,281	212,681	884,893	91,806	111,634	43,166	421,024	34,621	702,251	182,642	—513	27,319	154,810	.....
Chicago, St. Paul, Minn. & Omaha	1,739	680,678	345,613	1,102,151	91,702	144,424	24,965	504,856	28,625	794,572	307,579	—1,249	53,008	253,322	—109,736
Chicago Southern	114	37,870	.....	38,013	3,129	3,213	2,010	10,405	2,458	21,215	16,798	.....	2,175	14,623	15,504
Cincinnati, Hamilton & Dayton	1,036	533,546	129,816	743,159	67,562	129,897	22,611	345,770	22,038	587,878	155,281	.....	25,833	129,448	44,688
Coal & Coke	191	43,792	13,220	59,193	8,381	15,916	849	16,702	2,223	44,071	15,122	9,234	3,500	20,856	5,289
Colorado & Southern	1,248	636,046	113,046	792,231	87,897	123,246	12,346	274,869	21,677	520,035	272,196	—762	21,625	249,809	—16,034
Cumberland Valley	162	185,449	46,303	241,860	34,046	19,950	4,593	73,360	9,167	141,116	100,744	712	4,084	97,372	15,483
Delaware, Lackawanna & Western	931‡	2,264,809	548,778	2,998,097	140,483	432,307	56,828	851,007	61,177	1,541,802	1,456,295	30,157	151,600	1,334,852	—11,074
Detroit & Mackinac	347	56,860	25,176	86,939	18,677	17,194	2,014	33,006	3,070	73,961	12,978	—99	19,040	—6,160	16,843
Evansville & Terre Haute	310	130,741	52,333	201,624	23,746	36,668	4,127	64,028	6,551	135,120	66,504	—1,284	8,872	56,348	8,590
Fort Worth & Denver City	454	292,776	153,850	465,630	37,460	52,035	5,556	138,642	14,934	248,627	217,003	423	20	217,406	66,742
Fort Worth & Rio Grande	196	64,391	27,818	97,713	15,305	13,051	4,301	36,579	4,281	73,517	24,196	.....	1,948	22,248	—39,847
Gulf & Ship Island	307	135,104	38,840	187,082	35,680	29,132	1,656	35,095	7,648	129,211	57,871	.....	4,927	52,944	—6,282
Kansas City Southern	827	581,134	127,594	789,855	83,661	96,667	25,626	274,951	31,457	512,362	277,493	.....	25,831	251,662	—4,038
Lehigh Valley	1,440	2,592,923	330,788	3,022,794	281,651	497,792	74,079	926,431	67,549	1,847,502	1,175,292	—14,999	94,600	1,065,693	384,754
Maine Central	932	412,225	203,691	662,884	82,188	109,045	7,157	251,525	35,496	485,411	177,473	—570	39,235	137,668	19,719
Midland Valley	324	88,646	31,851	126,356	18,175	21,915	2,179	34,936	4,872	82,077	44,279	289	8,000	36,568	34,421
Mississippi Central	164	52,316	18,251	73,970	10,991	12,435	1,050	16,412	4,656	45,544	28,426	.....	1,500	26,926	9,923
New Orleans & North Eastern	196§	205,678	58,293	288,166	30,577	42,875	8,896	93,552	11,294	187,194	100,972	.....	6,724	94,248	3,387
New Orleans Great Northern	275	84,985	32,206	123,927	18,795	19,349	2,940	34,171	5,544	80,799	43,128	—60	1,200	41,867	34,847
New York, New Haven & Hartford	2,045	2,482,842	1,957,458	4,949,623	495,467	588,837	17,150	1,992,253	140,589	3,234,296	1,715,327	96,614	355,000	1,456,941	517,658
Norfolk & Southern	592	141,560	61,728	216,436	22,790	27,953	2,955	69,039	15,594	138,331	78,105	.....	6,200	71,905	7,298
Pere Marquette	2,330	936,013	295,746	1,326,495	136,500	160,460	33,408	542,535	32,996	905,899	420,596	4,917	47,073	378,440	140,459
St. Louis, San Francisco & Texas	132	52,308	11,808	67,294	18,400	16,315	3,241	47,073	3,349	88,378	—21,084	.....	852	—21,936	—19,866
Southern Indiana	236	98,986	14,485	115,124	14,139	18,535	2,033	35,799	4,665	75,171	39,953	—14	6,928	33,011	13,756
Tennessee Central	292	82,228	30,868	119,234	17,685	11,276	3,689	41,270	7,752	81,672	37,562	.....	4,199	33,363	7,231
Union R.R. (Pennsylvania)	31	.....	.....	244,530	32,306	59,034	101	121,265	11,435	224,141	20,389	4,525	18,842	6,072	—4,117
Vicksburg, Shreveport & Pacific	171	75,176	52,643	137,398	26,644	22,718	3,456	37,089	4,737	94,644	42,754	.....	8,241	34,513	—994
Wichita Valley	257¶	59,368	27,740	90,863	9,793	1,384	383	30,898	3,214	45,673	45,191	.....	2,796	42,395	16,652
SIX MONTHS OF FISCAL YEAR.															
Alabama & Vicksburg	142	$547,575	$251,715	$856,856	$133,452	$130,946	$21,718	$257,767	$30,978	$574,861	$281,995	.....	$26,151	$255,844	$81,319
Arizona & New Mexico	108	423,845	43,787	480,871	49,284	25,022	423	72,950	9,713	157,392	323,479	.....	8,665	314,814	—4,049
Bangor & Aroostook	546*	975,812	365,337	1,415,670	221,618	169,832	16,854	394,913	60,807	864,024	551,646	.....	9,000	542,646	81,739
Bessemer & Lake Erie	201	4,439,581	192,259	4,680,231	396,995	642,949	43,108	1,046,794	66,687	2,196,533	2,483,698	.....	69,210	2,414,448	765,381
Buffalo, Rochester & Pittsburgh	567	3,920,926	541,712	4,704,709	535,073	950,219	53,860	1,231,801	77,663	2,848,616	1,856,093	$501	78,000	1,778,594	741,642
Central New England	278	1,272,838	188,523	1,535,511	270,745	132,458	9,658	443,537	18,466	874,864	660,647	.....	39,000	621,647	186,924
Chicago & Eastern Illinois	965	4,752,380	963,308	6,018,725	548,809	1,084,033	132,878	1,936,333	194,610	3,896,663	2,122,062	—8,480	182,041	1,931,541	457,121
Chicago Great Western R.R.	1,486†	2,857,069	907,948	4,047,067	432,961	446,957	156,972	1,618,346	129,330	2,784,566	1,262,501	—4,646	109,275	1,148,580	.....
Chicago, St. Paul, Minn. & Omaha	1,739	4,908,696	2,388,974	7,790,841	1,087,240	891,219	143,037	2,737,956	165,678	5,025,130	2,765,711	1,165	318,047	2,448,828	48,242
Chicago Southern	114	202,109	.....	203,053	21,247	13,576	7,708	47,586	13,929	104,046	99,007	.....	12,350	86,657	70,856
Cincinnati, Hamilton & Dayton	1,036	3,503,798	944,236	4,977,942	655,682	815,660	128,203	1,879,771	160,509	3,639,825	1,338,117	.....	155,000	1,183,117	364,158
Coal & Coke	191	281,160	84,779	380,432	61,653	99,856	5,413	97,877	13,118	277,918	102,514	44,806	21,000	126,321	30,685
Colorado & Southern	1,248	3,746,590	936,739	4,932,427	666,169	774,613	85,455	1,514,347	126,151	3,166,736	1,765,692	—1,548	129,750	1,634,394	159,055
Cumberland Valley	162	1,082,533	331,942	1,476,416	200,887	133,296	24,077	418,394	36,370	813,024	663,392	3,378	24,502	642,268	66,889
Delaware, Lackawanna & Western	931‡	13,615,245	3,776,274	18,487,874	1,716,349	2,392,683	321,469	4,798,752	333,071	9,562,324	8,925,550	195,987	804,100	8,317,437	754,328
Detroit & Mackinac	347	403,308	163,978	601,010	101,549	93,712	12,659	189,419	15,759	413,098	187,912	1,340	54,346	134,906	20,959
Evansville & Terre Haute	310	845,270	321,138	1,287,622	144,834	175,489	29,875	360,967	40,098	751,263	536,358	—5,498	53,232	477,628	113,722
Fort Worth & Denver City	454	1,733,187	959,887	2,809,505	292,898	343,387	40,714	797,901	85,861	1,560,761	1,248,744	4,009	46,520	1,206,233	268,547
Fort Worth & Rio Grande	196	300,825	162,177	496,199	96,823	67,332	19,765	190,742	22,363	397,025	99,174	.....	9,811	89,363	—125,946
Gulf & Ship Island	307	790,317	227,661	1,086,713	203,947	178,211	7,654	314,445	43,843	748,100	338,613	.....	29,187	309,426	101,416
Kansas City Southern	827	3,393,140	732,114	4,598,759	525,179	618,308	152,424	1,516,490	179,028	2,991,429	1,607,330	.....	152,780	1,454,550	—114,430
Lehigh Valley	1,440	15,221,828	2,368,251	18,237,719	1,912,402	2,982,733	452,007	5,139,198	357,230	10,843,570	7,394,149	40,045	567,600	6,866,594	1,123,631
Maine Central	932	2,675,426	1,715,289	4,670,213	715,767	622,610	47,270	1,487,848	135,097	3,008,592	1,661,621	21,177	213,403	1,469,395	269,632
Midland Valley	324	482,928	170,466	686,980	110,874	133,207	11,593	183,707	27,451	466,832	220,148	—145	48,000	172,003	143,693
Mississippi Central	164	294,320	99,027	413,501	69,530	65,113	6,395	91,053	22,136	254,227	159,274	.....	8,100	151,174	61,045
New Orleans & North Eastern	196§	1,242,903	315,677	1,687,779	172,376	271,566	51,046	566,163	62,026	1,123,177	564,602	.....	48,824	515,778	93,147
New Orleans Great Northern	275	452,857	182,201	671,466	129,817	95,650	12,653	174,365	28,342	440,827	230,639	—487	5,700	224,452	189,943
New York, New Haven & Hartford	2,045	15,160,574	13,193,429	31,081,064	3,445,557	3,309,767	152,523	11,296,033	742,772	18,946,652	12,134,412	710,096	1,905,000	10,939,508	3,066,614
Norfolk & Southern	592	832,857	374,102	1,307,981	151,455	162,462	24,317	398,938	85,383	822,556	485,425	2,659	35,700	452,385	149,513
Pere Marquette	2,330	5,546,271	2,126,049	8,267,143	1,088,461	1,051,521	197,991	3,054,953	174,217	5,567,143	2,700,000	12,340	285,024	2,427,316	498,388
St. Louis, San Francisco & Texas	132	372,107	71,820	467,631	100,679	91,691	15,775	244,463	20,767	473,375	—5,744	.....	3,641	—9,385	—37,076
Southern Indiana	236	616,985	92,497	719,690	92,438	100,877	13,140	187,121	29,169	422,745	296,945	—836	41,571	254,538	104,388
Tennessee Central	292	527,429	205,093	769,132	101,325	86,575	21,688	240,786	48,695	499,069	270,063	.....	25,198	244,865	69,925
Union R.R. (Pennsylvania)	31	.....	.....	2,299,225	179,275	302,213	674	652,966	23,295	1,158,423	1,140,802	30,669	21,342	1,150,129	538,787
Vicksburg, Shreveport & Pacific	171	425,436	256,577	737,795	126,865	133,260	20,187	206,830	25,973	513,115	224,680	.....	39,750	184,940	29,668
Wichita Valley	257¶	266,627	137,924	421,851	50,089	18,747	1,703	135,352	11,971	217,862	203,989	.....	12,176	191,813	43,144

*Mileage operated December 31, 1908, 514. † Began operations September 1, 1909. ‡ Mileage operated December 31, 1909, 893. § Mileage operated December 31, 1908, 117. ¶ Mileage operated December 31, 1908, 174. — Indicates Deficits, Losses and Decreases.

Hearing on Milling-in-Transit.

Commissioner Clark, of the Interstate Commerce Commission, took testimony at Chicago last week in the investigation which the commission is making of alleged abuses of the transit privilege. The testimony indicated that by means of shipping out from points where the transit privilege is granted commodities different from those shipped in on the through billing, shippers in many lines of business are, in effect, getting the benefit of lower freight rates than those named in the published tariffs.

W. J. Tomkins, who is both traffic manager of the International Salt Company and general manager of the Michigan, Illinois & Indiana Transportation Company, a lake boat line which is understood to be owned by the salt company, told how shipments to the salt company's docks at Milwaukee, Wis., are stored and mixed there and held for two to 13 months and then shipped out under through rates. The rate across the lake from Ludington and Manistee, Mich., is 2⅓ cents. Nevertheless, the boat line is allowed by the railways a division of 4⅔ cents on through shipments. Cargoes are held at the concentrating point subject to the order of the shipper. Shipments are billed as having come from Ludington or Manistee, regardless of their actual point of origin. In this way the boat line gets its division of the through rate whether the salt has actually been hauled by it or not.

Testimony showed that eggs, poultry and butter may be shipped into a concentrating point and shipped out from it a year afterward on the through billing. Commissioner Clark called attention to the fact that under this system eggs might come in on the billing and chickens go out on it!

L. R. Richards, traffic manager of the Quaker Oats Company, contended that substitution of commodities should be allowed when the rate on the article which comes in on a through billing is the same as on the article which goes out on it. In response to questions by Commissioner Clark, however, he indicated that he had in mind merely the substitution, for example, of one kind of grain or grain products for another kind of grain or grain products; for example, that corn should be allowed to be shipped out on a wheat billing or that even corn products should be allowed to be shipped on a wheat billing, but that vegetable products should not be allowed to be shipped out on a grain billing.

A good deal of the testimony related to the use of the transit privilege on grain. The proportional rate out of any given point, Chicago, for example, on grain differs according to the point of origin of the grain. For example, the proportional rate east of Chicago is less on grain from a point, say, in Nebraska than on grain originating at a point farther east. Now, if a dealer ships into Chicago grain from both Nebraska and Illinois and sells his Nebraska grain in Chicago he has left two through billings, one for the Nebraska grain and one for the Illinois grain, on either of which he may ship out his Illinois grain. He will naturally use his Nebraska billing for shipping out the Illinois grain, because in that way he will get a lower freight rate out. The same thing would happen if, instead of selling his Nebraska grain locally in Chicago, he shipped it out by boat.

W. M. Hopkins, manager of the transportation department of the Chicago Board of Trade, contended that such substitution does not effect a cut in the rate. Suppose, for example, grain comes to Chicago from Kansas City and also from some point in Illinois. By shipping out the Illinois grain on the Kansas City billing and the Kansas City grain on the Illinois billing the shipper gains in two ways. The local rate from Kansas City to Chicago is 12 cents and from Chicago to Louisville 7 cents, a total of 19 cents. On through shipments from Kansas City via Chicago to Louisville the rate is 13 cents. The consequence is that by shipping out Illinois grain on the Kansas City billing the shipper is enabled to get grain from Kansas City to Chicago and from Chicago to Louisville for 6 cents per 100 lbs. less than if paid the local rate on grain from Kansas City to Chicago and the local rate from Chicago to Louisville. But Mr. Hopkins contended this did not hurt the railway because there is a lower adjustment via Peoria than via Chicago, and if the grain could not be handled this way through Chicago there would be no movement from Kansas City via Chicago to Louisville; the Chicago dealer would lose the business and the railway the tonnage.

William Ellis, commerce counsel of the Chicago, Milwaukee & St. Paul, testified that he recently had found that many grain shippers at Milwaukee have been shipping out under their billings more grain that they have credit for on the transit accounts.

Attorney John H. Marble, of the commission, called attention to other abuses of the transit privilege. In malting barley, for instance, there is a loss in weight of 25 to 30 per cent. The legitimate tonnage out on transit would, therefore, be less than the amount of the tonnage moved in. This difference has been taken advantage of, he said, by making up the deficit of tonnage from barley brought in on local rates.

INTERSTATE COMMERCE COMMISSION.

Intervention of Commission in Misrouting Cases.

Larrowe Milling Co. v. Chicago & North Western et al. Opinion by Commissioner Harlan.

The principal defendant has two routes from Janesville, Wis., to Chicago, a direct one of 91 miles and an indirect one through Waukesha and Milwaukee of 162 miles. On shipments moving from Janesville to Cattaraugus, N. Y., and Windber, Pa., over the direct route to Chicago, charges were based on the local rate to Chicago via that route and the through rate beyond, although the local rate over the indirect route through Waukesha, added to the through rate to destination

REVENUES AND EXPENSES OF EXPRESS COMPANIES.

FOR THE MONTH OF SEPTEMBER, 1909.

Name of company. Mileage of all lines covered: Rail lines	Adams Express. 30,958	American Express. 46,205	Canadian Express. 7,078	Can. Nor. Express. 3,164	Globe Express. 1,900	Great Nor. Express. 7,171	National Express. 1,094	Northern Express. 6,497	Pacific Express. 22,049	Southern Express. 31,043	United States Express. 23,904	Wells, Fargo & Co. 56,355	Western Express 3,452
Other lines	3,488	2,060	2,792	22	.....	211	292	261	608	2,995	611	4,844	4
Operating revenues:													
Express	$2,606,296	$2,933,754	$244,348	$29,973	$71,566	$223,091	$99,354	$314,595	$709,174	$925,774	$1,398,726	$2,295,765	$67,390
Misc. transportation	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	118	182
Nontransportation	13,301	124,162	4,299	1,007	435	1,114	350	5,191	9,300	12,164	22,263	38,756	945
T'l receipts, operation	2,619,597	3,057,916	248,642	30,980	72,002	224,204	99,704	319,786	718,474	937,937	1,420,989	2,334,639	68,517
Exprs. privileges—Dr.	1,345,231	1,394,030	124,054	11,491	35,692	90,451	37,239	154,233	348,146	439,935	654,953	1,112,724	28,522
Total	$1,274,366	$1,663,886	$124,588	$19,489	$36,310	$133,753	$62,465	$165,553	$370,328	$498,002	$766,035	$1,221,915	$39,995
Operating expenses:													
Maintenance	$58,915	$62,937	$1,850	$57	$590	$1,256	$236	$2,153	$10,925	$21,936	$38,392	$66,739	$455
Traffic	6,088	18,662	934	132	1,034	1,243	5	1,805	6,318	5,292	10,155	13,793	1,670
Transportation	895,537	1,122,563	76,242	9,073	13,952	50,393	44,714	71,323	212,156	325,059	593,643	811,725	19,171
General	64,213	101,918	8,045	1,433	2,618	3,171	2,820	3,750	12,656	47,541	45,173	55,321	2,869
Total	$1,024,753	$1,306,080	$80,070	$10,696	$18,194	$56,063	$47,775	$79,031	$242,056	$399,828	$687,363	$947,578	$24,165
Net operat'g rev. or def.	$249,613	$357,806	$37,519	$8,793	$18,116	$77,690	$14,690	$86,521	$128,272	$98,175	$78,672	$274,337	$15,830
Taxes	$13,219	5,009	1,150	130	550	3,328	5	3,500	4,948	9,983	7,756	16,624	461
Operating inc. or loss	$236,394	$352,796	$36,369	$8,662	$17,566	$74,362	$14,685	$83,021	$123,325	$88,192	$70,916	$257,713	$15,368

Indicates Deficits, Losses and Decreases.

December 31, 1908, 174.

from Chicago, made a lower combination. In the absence of a specific through rate, the case is controlled by rule 215 of conference rulings bulletin No. 4, and the complainant is entitled to reparation for the resulting overcharge. The commission intervenes in misrouting cases only when, as the result of the failure to obey the shipper's routing instructions, or as a result, without such instructions, of moving a shipment over a route carrying a higher rate than the rate in effect over another route reasonably available, additional transportation charges accrue. In these cases no such damage followed the routing of the shipments directly to Chicago, for the reason that under the rule referred to the lower combination of rates over the other route was applicable. (17 I. C. C., 443.)

Rebating Through Refund.

Armour Car Lines v. Southern Pacific Co. Opinion by Commissioner Clements.

Complainant contracted to furnish ice to defendant at sundry points on its line to be used in the refrigeration of perishable fruit shipments. It was agreed by the parties that a $1.90-per-ton rate should be established for shipments of ice from Los Angeles, Cal., to Yuma, Ariz. The published rate between the points named was $3 per ton. The $1.90 rate was not published until some months after the contract was made and not until 71 cars of ice had been shipped under the contract. On claim for reparation of the difference between the $1.90 rate and the $3 rate it is held that such a transaction is repugnant to the provisions of the act to regulate commerce, opens the door for the grossest form of favoritism and rebating, and presents no basis for reparation. (17 I. C. C., 461.)

Administrative Rulings.

The commission, recognizing the great benefits to be derived from uniformity of car service rules, endorses the code which was reported to the National Association of Railway Commissioners and by that association recommended to the state and interstate commissions, it being understood that this action is of course subject to the right of the commission to inquire into the legality or reasonableness of any rule or rules which may be the subject of complaint, and that announcement to that effect be made with the code of demurrage rules.

Rule 6 of the Southern Classification provides that where the tariff offers a reduced rate based on a certain fixed valuation a release, in the form specified in the tariff and containing the agreed valuation, must be written and signed by the shipper on the face of the bill of lading. As applied to a case where the shipper endorsed the released valuation on the bill of lading, but, not knowing the requirements of the rule, omitted to endorse the special form across its face, it was held that the rule is unreasonable and that it is the carrier's duty to secure the shipper's signature to such a release on the bill of lading when it has reasonable notice of his desire to take advantage of the lower rate on a released valuation.

It is the view of the commission that exchange bills of lading ought to show specifically the point of origin of the shipment and the route over which it has moved. (Adm. Rule.)

The rules governing the sale, use and redemption of mileage books should be a part of the tariff under which they are sold. If a carrier deems it wise to provide in such rules for the redemption of unusued portions of such books on the basis of the mileage rate for the portion used, it will be recognized by the commission as redemption "at the full tariff rates" within the meaning of Rule 76, conference rulings bulletin No. 4, when the books were sold under tariff authority and on the basis of a specific sum per mile. (Adm. Rule.)

Two carriers desiring a joint operation of their combined lines between two points propose that they shall be operated by a new and separate company which shall handle as its own, and under its own tariffs, all local business between those points, and shall handle all other business under some arrangement with the two lines which does not permit it to participate in the earnings on the through traffic. Rule 180, conference rulings bulletin No. 4, entitled "Lessee road not serving as common carrier," does not apply and that the road operating between the two points must concur in the through rates over its line.

As the agent of an intermediate carrier has no means of knowing just why a shipment has been routed through particular junctions he has no right to substitute his own judgment as to routing for the specific routing instructions accompanying the shipment. In a stated case the initial carrier issued bills of lading showing particular routing but no rate; the transfer billing subsequently issued to a connecting line showed the routing and a 10-cent division of a 33-cent rate that did not apply through the junctions named but through another junction; and the agent of the connection therefore diverted the shipment through the latter junction to destination. It subsequently appeared that because of the diversion the shipper had lost a transit right at a given point on the route specified, which was necessary to effect the sale of the shipment at destination. As tariffs are permitted to contain rules providing that they are subject to the transit privileges shown on the tariffs of individual carriers on file with the commission, the intermediate line was responsible to the shipper for the difference between the rate paid in order to get the shipment back to the transit point and the legal rate over the route directed by the shipper.

A bill of lading showed a rate of $1.55 per ton and routing in care of a connecting line. Through one junction the two carriers had a joint through rate of $1.75 per ton; through another junction equally direct but carrying no joint rate, the combination through rate was $1.55 per ton. While an initial line is not chargeable always with knowledge of the rates of its connections, yet having accepted a shipment and a bill of lading on which the consignor had noted a definite rate it was its duty to find that rate and route the shipment accordingly or to call on the consignor for further instructions: and failing to do either it is liable for the excess in transportation charges resulting from routing the shipment through one junction when through another junction equally direct the locals make a through charge of the amount named in the bill of lading.

The commission has expressed the view that a transit privilege extending through a period of more than one year is *prima facie* unreasonable. (Rule 204, conference rulings bulletin No. 4.) Experience has shown, however, that as applied to the creosoting of lumber a period of 18 months is not unreasonably long, provided the full local rates on the inbound material are required to be paid.

On inquiry as to the legality of a practice permitting the stoppage of shipments of perishable commodities at points short of destination to partly unload, it was held that the practice is legal only when authorized under proper tariff rules.

A carload shipment routed by the consignor in order to get particular delivery at destination reached the wrong delivery tracks. Instead of demanding delivery on the right tracks the consignee moved the contents of the car by dray, although the car could have been switched to the proper tracks without additional expense to the shipper had he given the carrier the opportunity to do so. It was held that no reparation could be allowed.

Certain shipments were delivered at destination as actually routed by the consignor, but there was a general understanding with the carrier, not covered by tariff provision, that traffic should be diverted at a certain point in order to accommodate consignees located near certain team tracks on the delivering line. The agent having failed to divert the shipments at that point the consignees were subjected to extra drayage charges. The claim for a refund must be rejected.

The commission adheres to Rule 68, conference rulings bulletin No. 4, to the effect that it is not a proper practice for railways to adjust claims immediately on presentation and without investigation. The fact that shippers may give a bond to secure repayment in case, on subsequent examination, their claims prove to have been improperly adjusted does not justify the practice. Carriers that have adopted that practice will be expected promptly to discontinue it.

A car of coal was forwarded to the destination named in

the bill of lading, but the carrier not being able to find the consignee and learning that a company of the same name at a nearby point was tracing a coal shipment, reconsigned it to that point without consulting the consignor, and that subsequently proved to be the correct destination. A refund might be allowed on showing that the additional transportation expense fell on the consignor. In this connection the general principle is expressed in the following rule: If a shipper sends a shipment to an erroneous destination he should have the right to guard, so far as possible, against resulting loss by disposing of the shipment at that point. The carrier should not, therefore, forward such shipment to another destination with attendant additional transportation charges without having made reasonable effort to secure disposition instructions from the shipper.

If a limited passenger ticket is lost or destroyed before being used (and no error or neglect of a carrier's agent is involved), it is not unlawful for the carrier, after the limit of the ticket has expired, to refund to the passenger the extra fare paid as a result of such loss or destruction, provided the loss or destructon, the identity of the claimant as the original holder, and the fact that the extra fare was paid for travel by the original holder over the route and within the limit of the lost ticket, are clearly and definitely proved in a form that becomes a part of the record in the case; and provided it is clearly shown that such ticket has not been used or redeemed by any other person. Such action should be withheld for a sufficient period of time properly and reasonably to guard against the lost ticket being redeemed or used by some person other than the original holder.

A carrier in reissuing a tariff brought forward certain rates originally named in a previous tariff, and also slightly increased the rates named between the same points on the same commodity in a supplement to the previous tariff. Where a tariff contains conflicting rates the lower or lowest of the rates so published is the legal rate.

The yardmen of an interstate carrier being under the impression that a loaded car was empty delivered it to a switching road by which it was switched to a loading point, and the error being there discovered it was thence switched back. While the switching line may treat the shipment as analagous to an astray movement and on that account may waive its charges if it desires to do so, it may nevertheless lawfully demand and collect of the carrier that made the error its lawful rates for the service performed.

A canal boat line carrying traffic moving from New York city to Canadian points under an arrangement for through movement, the traffic being transferred to a rail line at Buffalo by its own agents or the agents of the railway, is a common carrier under the act and must file tariffs with the commission.

A shipment was routed through a certain junction by the consignor but on the papers presented to the commission it did not clearly appear whether he also named the rate that had been available through that junction but was canceled shortly before the movement. The instructions were complied with by the carrier and the new and higher rate applied. This was a shipper's error and the higher rate must be collected unless he also named in the bill of lading the lower rate legally in effect through another junction, in which case carrier was liable.

Rule 61 of Tariff Circular 17-A and Rule 65 of Bulletin No. 3 are hereby withdrawn and the previous ruling of February 4, 1908, is restored. The original rule (now reported as rule 26, conference rulings bulletin No. 4), is here repeated for general information, as follows:

If title to property, such as postal cards, passes to the government at the point of manufacture, the carrier may agree upon a rate to be applied for transporting it for the government to another point, without filing a tariff with the commission. But if the manufacturer under his contract is required to deliver to the government at such other point the transportation must be under the published tariff rate. In other words, if the shipment is made directly by the government, this rate may be fixed by the carrier without posting and filing the tariff, but not otherwise.

There is nothing in the provisions of section 22 of the act relating to free or reduced rate transportation to warrant carriers in according free transportation to scientists or other employees of a public museum.

While it is the policy of the commission to entertain complaints instituted on behalf of shippers by traffic or credit bureaus in all such cases where reparation is awarded the order will require payment to be made by the defendant carriers either to the consignor or the consignee, as their interests may appear.

Through error a carrier's agent so punched a round-trip ticket to New York as to limit its use to October 14 instead of October 17. The holder at destination requested a correction, and the ticket being sent back for that purpose by the passenger agent, was lost in the mails. The initial carrier's agent at New York secured from its connection a return ticket in lieu of the lost ticket. It now asks that its connections be authorized to accept report of this ticket without revenue. It is held that the initial carrier must pay the cost of the return ticket.

STATE COMMISSIONS.

The State Railroad Commission of Georgia has ordered the railways centering in Atlanta to publish a joint passenger train time-table in at least one of the daily papers of the city.

A. W. Campbell, deputy minister of public works of Ontario, Can., has been appointed deputy minister of railways and canals of Canada, succeeding N. J. Butler, recently resigned.

The State Railroad Commission of Georgia has issued an order requiring the railways to report each week all late passenger trains, and also to report by wire or by other prompt method, every accident causing death or injury. Monthly reports of accidents are required, for each month, within ten days after the close of the month.

The New York State Public Service Commission, First district (New York City), has asked the legislature to appropriate $600,000 for the elimination of grade crossings within the limits of New York City. It is proposed to divide this sum between the different counties within the city as follows: Queens, $400,000; Kings, $50,000; Richmond, $50,000; New York, $100,000.

The South Dakota Railway Commission has issued an order fixing a distance tariff on coal hauled in the territory west of the Missouri river in South Dakota. The following figures indicate the extent of the reduction: Fifty miles, present rate $1.60, new rate $1.20; 100 miles, present rate $2.60, new rate $1.90; 200 miles, present rate $4, new rate $2.80; 300 miles, present rate $5, new rate $3.50; 400 miles, present rate $6.10, new rate $4.30; 500 miles, present rate $6.60, new rate $4.70.

The New York Upstate Public Service Commission has appointed Charles R. Vanneman as steam railway inspector to succeed Jefferson D. Shultz, who resigned. Mr. Shultz had been in the employ of the board of railway commissioners and the public service commission continuously since February 1, 1899. Mr. Vanneman is a graduate of the College of Civil Engineering of Cornell and began work in the maintenance of way department of the Pennsylvania Railroad. He was promoted to assistant supervisor of the Northern Central at Elmira in January, 1906. From 1907 to 1909 he was engineering examiner and principal assistant to the chief examiner of the State Civil Service Commission at Albany, and was later acting chief examiner for that commission. At the present time he is employed as assistant engineer in the department of state engineer and surveyor.

New York: Extra Fare on Train Approved.

James Morris v. the Buffalo, Lockport & Rochester. Opinion by Commissioner Decker.

An interurban railway is entitled to make proper regulations for the collection of its fares, and requiring a passenger at a ticket station to purchase a ticket for delivery to the conductor with provision in case of failure for collection of an excess charge of five cents to be refunded at any ticket office on demand is reasonable.

A time limitation for redemption of duplex excess fare re-

ceipts should be sufficiently long to cover inadvertent omissions to promptly present the duplex receipts for redemption. Respondent's time limitation of 30 days for redemption of its duplex excess fare receipts held unreasonable and unjust, and such time limitation to be reasonable and just should not be less than three months from the date of issue and should be plainly shown on respondent's duplex receipts.

COURT NEWS.

The supreme court of Minnesota has rendered a decision upholding the constitutionality of the Minnesota reciprocal demurrage law. The decision was made in the case of the Chicago, Rock Island & Pacific versus the Hardwick Farmers' Elevator Company. The elevator company sued the railway under the provisions of the reciprocal demurrage act for $218 for delay in furnishing cars.

Judge T. S. Maxey, of the federal court, made a ruling at San Antonio, Tex., on January 28, that the lease of the Galveston, Harrisburg & San Antonio to the Southern Pacific Company "is contrary to public policy, null and void." The ruling was made in the case of Thomas H. Hubbard et al. versus the Galveston, Harrisburg & San Antonio, a suit filed for interest on $2,000,000 of the second mortgage bonds of the G., H. & S. A., which, it was alleged, has not been paid since the Southern Pacific leased the road in 1885. The court was asked to decree that the earnings of all of the roads controlled by the Southern Pacific Company be applied to the payment of this interest. The court held that the Galveston, Harrisburg & San Antonio Company had no power to lease the property of this road to the Southern Pacific and that, therefore, the complainants had no claim upon the earnings of any other property controlled by the Southern Pacific. As the suit was not brought for the purpose of determining the legality of the control by the Southern Pacific of the G., H. & S. A., the ruling is collateral, and will not have any direct effect on the relations of the two companies.

United States Supreme Court: Car Distribution.

The Interstate Commerce Commission, appellant, v. the Illinois Central. Appeal from the circuit court of the United States for the Northern district of Illinois. Opinion by Justice White.

Whether a duty rested upon the Illinois Central Railroad Company to obey an order made by the Interstate Commerce Commission is the question here to be decided.

On the ground that preferences were created and discriminations engendered by regulations established by the railway company concerning the daily distribution of coal cars to mines along its line in periods when the supply of such cars was inadequate to meet the demand upon it for the movement of coal, the order in question commanded the railway company to desist from enforcing the regulations found to be preferential, and for a future period of two years to deliver cars to mines along its line in conformity with the rule announced by the commission.

A clearer perception of the questions to be considered will be afforded by giving a brief statement of the cause of car shortage referred to, accompanied with a mere outline of the steps generally taken by carriers to deal with the subject and the particular method applied by the Illinois Central prior to the date when the complaint was made against it, concerning which the order previously referred to was entered.

It is conceded in argument that bituminous coal mines, which are the character of mines here involved, must dispose of their product as soon as the coal is delivered at the surface, as it is not practicable for an operator to store such coal, and the amount that a mine will produce is therefore directly dependent upon the quantity that can be taken away day by day. As a result of this situation it is also conceded that railways upon whose lines coal mines are situated pursue a system by which daily deliveries of cars, based upon requisitions of the respective mines, are made to such mines to permit of the removal of their available output for that day.

Notwithstanding full performance by railway carriers of the duty to have a legally sufficient supply of coal cars, it is conceded that unforeseen periods arise when a shortage of such cars to meet the demand for the transportation of coal takes place. * * *

It is disclosed that the railways of the United States generally, at various times, put in force regulations for the distribution of coal cars. Generally speaking, these regulations provide for fixing the capacity of coal mines in order to determine the number of cars to which each might normally be entitled to daily move its output of coal. And these regulations also provide for a method of determining the *pro rata* share of the cars daily allotted for distribution in times of car shortage. Neither the method by which capacity was to be ascertained nor the regulation for daily distribution upon the basis of such capacity in case of shortage were identical among the various railway systems of the United States. * * *

In a general sense, however, all the regulations of the various railways, either for ascertaining the capacity of coal mines or in order to determine the *pro rata* share for daily distribution of cars to the respective mines in case of shortage dealt with four classes of cars: 1, system cars, that is, cars owned by the carrier and in use for the transportation of coal; 2, company fuel cars, that is, cars belonging to the company and used by it when necessary for the movement of coal from the mines on its own line, and which coal had been bought by the carrier and was used solely for its own fuel purposes; 3, private cars, that is, cars either owned by coal mining companies or shippers or consumers, and used for the benefit of their owners in conveying coal from the mines to designated points of delivery; 4, foreign railway fuel cars, that is, cars owned by other railway companies and which were by them delivered to the carriers on whose lines mines were situated, for the purpose of enabling the cars to be loaded with coal and returned to the company by whom the cars had been furnished, the coal being intended for use as fuel by such foreign railway companies.

The various regulations, irrespective of minor differences between them, fell upon one or the other side of this broad line of division. One system took into account class 2, the fuel cars of the carrier, class 3, the private cars, and class 4, the cars of foreign railways, and deducted from the rated capacity of the mine the sum of coal delivered by that mine in such cars, and upon the basis thus resulting apportioned ratably in case of shortage the system cars, that is, those embraced in class 1. On the other hand the other class of regulation not only took no account of the cars in classes 2, 3 and 4, as a means of rating the capacity of the mine, but moreover did not charge against any mine, for the purpose of ascertaining the daily *pro rata* of the cars to which such mine was entitled, any car whatever furnished such mine on such day embraced within classes 2, 3 and 4, that is, any company fuel car, foreign railway fuel car or private car. * * *

Previous to 1907 the railway commission of the state of Ohio filed with the Interstate Commerce Commission two complaints against the Hocking Valley and another railway company. These complaints were based upon the ground that the failure of the railways in times of car shortage to include in the *pro rata* of cars for distribution foreign railway fuel cars and private cars, and to charge the mines which had received such cars with the same as part of their distributive share, created an undue preference and worked unjust discrimination in violation of the act to regulate commerce. On July 11, 1907, the report and opinion of the commission was announced in the cases referred to. 12 I. C. C., Rep. 398. It was declared that the complaints were well founded, and the relief prayed was awarded. Nine days afterwards—presumptively in ignorance of the finding of the commission just referred to—the Illinois Central promulgated rules governing the distribution of cars to coal mines. Although by these rules foreign fuel cars, private cars and company fuel cars were not taken into account in ascertaining the capacity of a mine or mines, such cars were expressly directed not to be counted for the purpose of the daily distribution of cars among the respective mines. * * *

On October 31, 1907, the Illinois Collieries Company filed with the Interstate Commerce Commission a complaint against the Illinois Central. The regulations of the railway company as to the distribution of coal cars were assailed as unjustly

discriminatory in violation of the act to regulate commerce, particularly as respected the practice of not taking into consideration foreign railway fuel cars and private cars in determining the distribution of coal cars among the various coal operators along the lines of the railway on interstate shipments of coal. It appears that the complaint just referred to was heard before the commission, with two other complaints against other railways involving the same general subject. In its report, which was filed in all three of the cases on April 13, 1908 (13 I. C. C., Rep. 451), the commission held that not to count in times of car shortage when the daily distributions were made against the mine receiving the same company fuel cars, foreign railway fuel cars and private cars was a violation of the act to regulate commerce. In announcing this conclusion reference was made to the previous opinion of the commission in the Hocking Valley case, *supra*, and it was declared that the Illinois Central Railroad Company on the hearing before the commission had conceded the controlling effect of the previous ruling of the commission. Considering the temporary injunction [restraining the Illinois Central from putting in effect the rules of the I. C. C.] issued by the circuit court of the United States for the Northern district of Illinois, the commission declared that in view of the decision of this court in the case of the *Texas & Pacific Railroad Company v. Abilene Cotton Oil Co.*, 204 U. S. 426, it was the duty of the commission to order the carrier to desist from the unlawful discrimination. * * *

The order of the commission, as heretofore stated, therefore not only directed the desisting from the practice of failing to take into account the foreign railway fuel cars, private cars and the company fuel cars, but also required the carriers to establish regulations for a period of two years from July 1, 1908, providing for the counting of all such cars. The general scope of the order was, however, qualified by expressly authorizing a railway company to deliver to a particular mine all the foreign railway fuel cars, the private cars and the company fuel cars consigned or assigned to said mine, even although the number thereof might exceed the *pro rata* share of the cars attributable to said mine when ascertained by taking into account all the cars which the order required to be considered. Where, however, the number of such cars was less than the *pro rata* share of the mine the order only permitted the carrier to add a sufficient number of system cars to make up the rightful *pro rata* number.

Being unwilling to comply with the order of the commission, the Illinois Central Railroad Company commenced the suit which is now before us to enjoin in all respects the enforcement of the order of the commission. * * * Besides charging that the order to count the company fuel cars was unjust, unreasonable, etc., it was averred that the attempt of the commission to deal with such cars was beyond its power, and was but an effort to deprive the company of its lawful right to freely contract for the purchase of the fuel necessary for the operation of its road. * * * The commission answered by asserting the validity in all respects of the order by it made, substantially upon the grounds which had been set out in its report and opinion announced when the order was made. All the averments in the complaint as to want of power were traversed and it was expressly charged that the subject of the distribution of coal cars as dealt with by the order was within the administrative power delegated to the commission by the terms of the act to regulate commerce. * * * The question was submitted at the same time with one brought by the Chicago & Alton, involving a similar question, to a circuit court held by Judges Grosscup, Baker and Kohlsaat. A single opinion was announced in both cases. While deciding that the complainants were not entitled to relief in so far as the order of the commission concerned the counting of foreign railway fuel cars and private cars, it was yet held that the railway companies were entitled to an injunction restraining the enforcement of the orders of the commission in so far as they directed the taking into account of the cars employed by the company in hauling its own fuel. The conclusion on this latter subject was based upon the theory that, as the railway companies took the coal which they bought for their own use from the tipple of a coal mine, and thereafter moved it for their own account and not for commercial purposes, that the cars used for that purpose could not be treated as being engaged in commerce, as "commerce under these circumstances ends at the tipple." * * *

And in accord with this reasoning it was in conclusion remarked that the complainants as to the cars used for hauling their fuel were entitled to an injunction "against their being compelled to take fuel cars into consideration except as a means in determining the true capacities of the mines to tender coal to them for transportation in commerce."

From the final decree enjoining the commission from enforcing its order, in so far as it directed the taking into account the company fuel cars in the distribution of coal cars in times of car shortage and in so far as it directed the future taking such cars into account, the Interstate Commerce Commission appeals. * * *

In consequence of one of the comprehensive amendments to the act to regulate commerce, adopted in 1906 (Sec. 15, Act June 19, 1906, 34 Stat. 589), it is now provided that "all orders of the commission, except orders for the payment of money, shall take effect within such reasonable time, not less than 30 days, and shall continue in force for such period of time not exceeding two years, as shall be prescribed in the order of the commission, unless the same shall be suspended or set aside by a court of competent jurisdiction." The statute endowing the commission with large administrative functions, and generally giving effect to its orders concerning complaints before it without exacting that they be previously submitted to judicial authority for sanction, it becomes necessary to determine the extent of the powers which courts may exert on the subject.

Beyond controversy, in determining whether an order of the commission shall be suspended or set aside, we must consider, *a*, all relevant questions of constitutional power or right; *b*, all pertinent questions as to whether the administrative order is within the scope of the delegated authority under which it purports to have been made; and, *c*, a proposition which we state independently, although in its essence it may be contained in the previous one, viz., whether, even although the order be in form within the delegated power, nevertheless it must be treated as not embraced therein, because the exertion of authority which is questioned has been manifested in such an unreasonable manner as to cause it, in truth, to be within the elementary rule that the substance, and not the shadow, determines the validity of the exercise of the power. *Postal Telegraph Company v. Adams*, 155 U. S. 688, 698. Plain as it is that the powers just stated are of the essence of judicial authority, and which, therefore, may not be curtailed, and whose discharge may not be by us in a proper case avoided, it is equally plain that such perennial powers lend no support whatever to the proposition that we may, under the guise of exerting judicial power, usurp merely administrative functions by setting aside a lawful administrative order upon our conception as to whether the administrative power has been wisely exercised.

Power to make the order and not the mere expediency or wisdom of having made it, is the question. While, as we have seen, the court below reasoned that the transportation of coal bought from a mine by the railway company for its own use, after delivery to it in its coal cars at the tipple, was not commerce, because "commerce under these circumstances ends at the tipple," it yet reasoned that such coal was within the control of the interstate commerce law to the extent that a regulation compelling its consideration, for the purpose of rating the capacity of a mine as a basis for fixing its *pro rata* share of cars in times of shortage, would be valid. Because of this reasoning, it is insisted, it appears that the court below but substituted a regulation which it deemed wise for one which it considered the commission had inexpediently adopted, and this upon the assumption by the court that its authority was not limited to determining power. Without intimating an opinion as to the merits of the proposition, we put it aside as irrelevant, since we must decide whether the action of the court below was correct, irrespective of the reasoning by which such action was induced. * * *

We think the issues for decision will be best disposed of by at once considering the contentions advanced by the railway company to establish that there was a want of power in the commission to make that portion of the order which the court below enjoined. The contentions on this subject are

stated in argument in many different forms, and if not in some respects contradictory, are, at all events, confusing and often illusive, since, while seemingly addressed to power, they virtually intermingle power and expediency as if they were one and the same thing. We shall not, therefore, in making an analysis of the contentions, follow their mere form of statement, but shall treat them all as reducible to two propositions, viz.: First.—That the act to regulate commerce has not delegated to the commission authority to consider, where a complaint is made on such subject, the question of the distribution of company fuel cars in times of car shortage as a means of prohibiting unjust preference or undue discrimination. Second.—That even if such power has been delegated to the commission by the act to regulate commerce, the order whose continued enforcement was enjoined by the court below was beyond the authority conferred by the statute. * * *

When coal is received from the tipple of a coal mine into coal cars by a railway company, and the coal is intended for its own use and is transported by it, it is said there is no consignor, no consignee and no freight to be paid, and therefore, although there may be transportation, there is no shipment, and hence no commerce. In changed form these propositions but embody the reasoning which led the court below to its conclusion that, under the circumstances, commerce ended at the tipple of the mine. The deduction from the proposition is, as the movement of coal under the conditions stated is not commerce, it is therefore not within the authority delegated to the commission by the act of Congress, as all such acts have relation to the regulation of commerce, and do not, therefore, embrace that which is not commerce. It is to be observed, in passing, that if the proposition be well founded, it not only challenges the authority of the commission, but extends much further, and in effect denies the power of Congress to confer authority upon the commission over the subject. In all its aspects the proposition calls in question the construction given to the law by the commission in every case where the subject has been before it, and also assails the correctness of numerous decisions in the lower federal court, to which we have previously referred, where the subject, in various forms, was considered. * * *

Under these conditions, it is clear that doubt, if it exist, must be resolved against the soundness of the contentions relied on. But that rule of construction need not be invoked, as we think, when the erroneous assumption upon which the proposition must rest is considered, its unsoundness is readily demonstrable. That assumption is this, that commerce in the constitutional sense only embraces shipment in a technical sense, and does not, therefore, extend to carriers engaged in interstate commerce, certainly in so far as so engaged, and the instrumentalities by which such commerce is carried on, a doctrine the unsoundness of which has been apparent ever since the decision in *Gibbons v. Ogden*, and which has not since been open to question. It may not be doubted that the equipment of a railway company engaged in interstate commerce, included in which are its coal cars, are instruments of such commerce. From this it necessarily follows that such cars are embraced within the governmental power of regulations which extends, in time of car shortage, to compelling a just and equal distribution and the prevention of an unjust and discriminatory one.

The corporation as a carrier engaged in interstate commerce being then, as to its interstate commerce business, subject to the control exerted by the act to regulate commerce, and the instrumentalities employed for the purpose of such commerce, being likewise so subject to control, we are brought to consider the remaining proposition, which is:

Second.—*That even if power has been delegated to the commission by the act to regulate commerce, the order whose continued enforcement was enjoined by the court below was beyond the authority delegated by the statute.*

In view of the facts found by the commission as to preferences and discriminations resulting from the failure to count the company fuel cars in the daily distribution in times of car shortage, and in further view of the far-reaching preferences and discriminations alleged in the answer of the commission in this case, and which must be taken as true, as the cause was submitted on bill and answer, it is beyond controversy that the subject with which the order dealt was within the sweeping provisions of section 3 of the act to regulate commerce prohibiting preferences and discriminations. But it is contended that although this be the case, as the order of the commission not only forbade the preferences and discriminations complained of, but also commanded the establishment of a rule, excluding such discriminations for a future definite period of not exceeding two years, the order transcended the authority conferred upon the commission. This proceeds upon the assumption that section 15 of the act to regulate commerce, as enacted by the act of June 29, 1906, while conferring upon the commission the authority, upon complaint duly made, to declare a rate or practice affecting rates illegal, and to establish a new and reasonable rule or practice affecting such rates for a term not exceeding two years, has no relation to complaints concerning preferences or discriminations, unless such practices, when complained of, are of a character to affect rates, which it is insisted is not here the case. * * *

The contention gives to the words found in the earlier part of the section [in question] "any regulation or practice whatsoever of such carrier or carriers affecting such rates," a dominant and controlling power so as to cause them to limit every other provision in the section, however general in its language. We do not stop to critically examine the provision relied upon for the purpose of pointing out, as a matter of grammatical construction, the error of the contention, because we think, when the text of the section is taken into view and all its provisions are given their natural significance, it obviously appears that the construction relied upon is without foundation, and that to sustain it would be to frustrate the very purpose which it is clear, when the entire provision is considered, it was designed to accomplish, and thus would be destructive of the plain intent of Congress in enacting the provision. The antecedent construction which the interstate commission act had necessitated, and the remedial character of the amendments adopted in 1906, all serve to establish the want of merit in the contention relied upon. In addition, to adopt it would require us to hold that Congress, in enlarging the power of the commission over rates, had so drafted the amendment as to cripple and paralyze its power in correcting abuses as to preferences and discriminations which, as this court has hitherto pointed out, it was the great and fundamental purpose of Congress to further.

Conceding, for the sake of the argument, the existence of the preferences and discriminations charged, it is insisted, when the findings made by the commission are taken into view and the pleadings as an entirety are considered, it results that the discriminations and preferences arose from the fact that the railway company chose to purchase its coal for its fuel supply from a particular mine or mines, and that, as it had a right to do so, it is impossible, without destroying freedom of contract, to predicate illegal preferences or wrongful discriminations from the fact of purchase. But the proposition overlooks the fact that the regulation addresses itself, not to the right to purchase, but to the duty to make equal distribution of cars. The right to buy is one thing and the power to use the equipment of the road for the purpose of moving the articles purchased in such a way as to discriminate or give preference are wholly distinct and different things. * * * At best, these arguments but suggest the complexity of the subject, and the difficulty involved in making any order which may not be amenable to the criticism that it leads to or may beget some inequality. Indeed, the arguments just stated, and others of a like character which we do not deem it essential to specially refer to, but assail the wisdom of Congress in conferring upon the commission the power which has been lodged in that body to consider complaints as to violations of the statute and to correct them if found to exist, or attack as crude or inexpedient the action of the commission in performance of the administrative functions vested in it, and upon such assumption invoke the exercise of unwarranted judicial power to correct the assumed evils. It follows from what we have said that the court below erred in enjoining the order of the commission, in so far as it related to company fuel cars, and its decree is therefore reversed, and the case remanded for further proceedings in conformity with this opinion.

Justice Brewer dissents.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

J. F. Holden, vice-president and general manager of the Midland Valley, with office at Muskogee, Okla., has resigned to accept service elsewhere.

W. L. Greenhalgh, auditor of the Mississippi Central, with office at Hattiesburg, Miss., has resigned to become assistant auditor of the Wiggans Ferry Company at St. Louis, Mo.

H. M. Andrews, assistant to the general solicitor of the Erie at New York, has been appointed an assistant general solicitor, with office at New York, succeeding John W. Dixon, resigned, to go to another company.

L. H. Attwell, Jr., secretary and auditor of the Trinity & Brazos Valley, with office at Houston, Tex., has been appointed also auditor of the Galveston Terminal Railway, succeeding James Van den Broeck, resigned to accept service elsewhere.

H. M. George, secretary and treasurer of the Delaware & Eastern at New York, has been elected vice-president, G. A. Hilton has been elected secretary, A. S. Brown has been elected treasurer, and E. T. Allwood has been appointed auditor of freight and passenger receipts, all with offices at New York.

W. M. Whitenton, manager of the Southern and Choctaw districts of the Chicago, Rock Island & Pacific, at El Reno, Okla., has been elected vice-president and general manager of the Chicago, Rock Island & Gulf, with office at Fort Worth, Tex., succeeding J. W. Robins, resigned. A photograph and sketch of Mr. Whitenton's railway life was published in our issue of January 28, page 205.

As noted in another column, Darius Miller, first vice-president of the Chicago, Burlington & Quincy, and the Colorado & Southern, has been elected president of both companies, succeeding George B. Harris, who remains as chairman of the executive committee; H. E. Byram, assistant to first vice-president, of the Chicago, Burlington & Quincy, with jurisdiction over the operating departments, has been elected vice-president of that company and the Colorado & Southern, succeeding Darius Miller and C. G. Burnham, assistant to first vice-president of the C. B. & Q., with jurisdiction over the traffic departments, has been elected vice-president of both companies, succeeding Daniel Willard, resigned, to become president of the Baltimore & Ohio.

The accounting department of the New York Central & Hudson River has been reorganized as follows: Richard A. White, auditor at New York, has been appointed general auditor; Charles H. Chambers, auditor of disbursements, succeeds Mr. White; James H. Foulds, Jr., succeeds Mr. Chambers, and Malcolm R. Connell has been appointed assistant auditor of disbursements; Arthur L. Linn, Jr., has been appointed auditor, also auditor of subsidiary lines; Robert L. Calkins remains as freight and claim agent, and John K. Lovell has been appointed assistant freight claim agent; William T. McCulloch, auditor of freight accounts, has been appointed auditor of revenue; Frank E. Briggs succeeds Mr. McCulloch; James L. Ferris remains as auditor of passenger accounts, and John L. Snow has been appointed assistant auditor of passenger accounts; John F. Fairlamb, general passenger agent, has been appointed auditor of miscellaneous accounts; William A. Cormier has been appointed assistant auditor of miscellaneous accounts, and Charles L. Cormier has been appointed chief traveling auditor, all with offices at New York.

Operating Officers.

W. C. C. Mehan, superintendent of the Grand Trunk Pacific at Melville, Sask., has been appointed a general superintendent, with office at Prince Rupert, B. C.

C. A. Brunn, superintendent of the Buffalo division of the Erie at Buffalo, N. Y., has been appointed also manager of the Union Steamboat Line, which is operated by the Erie.

W. A. Carney has been appointed trainmaster of the Southern for lines east of Huntingburg, Ind., with office at Louisville, Ky., succeeding J. F. Sheridan, resigned, to go to another company.

James Van den Broeck, auditor of the Galveston Terminal Railway at Galveston, Tex., has been appointed general manager of the Bartlett & Florence, with office at Bartlett, Tex.

W. H. Powley has been appointed assistant superintendent of the Chicago Southern and the Southern Indiana, with office at Terre Haute, Ind. The office of C. A. Wilson, trainmaster, has been abolished.

P. J. O'Brien, division superintendent of the Chicago & North Western at Baraboo, Wis., has been appointed superintendent, with office at Chicago, succeeding W. D. Beck, resigned. G. B. Vilas, assistant superintendent at Baraboo, succeeds Mr. O'Brien, and F. J. Byington, chief train despatcher at Boone, Iowa, succeeds Mr. Vilas.

G. Stoner, trainmaster of the Missouri, Kansas & Texas at Denison, Tex., has been appointed superintendent, with office at Denison, succeeding W. G. Koch, resigned to accept service elsewhere. C. H. Hurdleston, superintendent of the Trinity division at Trinity, Tex., succeeds Mr. Stoner, and W. P. Danforth, traveling engineer, succeeds Mr. Hurdleston.

John William Dean, whose appointment as general superintendent of the Denver & Rio Grande, with office at Pueblo, Colo., was announced in these columns some time ago, was born January 15, 1867, near Lexington, Mo. He received a common school education and began railway work as a messenger boy on the Chicago & Alton in 1877. He was later operator and agent on the Alton, and in 1882 went with the Kansas City, Ft. Scott & Memphis, now a part of the Frisco, first as operator and later as brakeman. For three years from 1883 he was with the Missouri Pacific as copy operator in the despatcher's office. In 1887 he was operator, and was afterwards consecutively brakeman, yardmaster, despatcher, chief despatcher and trainmaster on the Atchison, Topeka & Santa Fe until 1902, when he was appointed trainmaster and superintendent of terminals of the Denver & Rio Grande. In 1903 he was made superintendent of the Colorado & Southern, and he was superintendent of the National Railroad of Mexico from 1904 to 1905, when he became trainmaster of terminals of the Illinois Central at Memphis, Tenn. Later in the same year he was made superintendent of the Missouri Pacific at St. Louis, Mo., from which position he was promoted in November, 1909.

John W. Dean.

J. L. Truden, superintendent of the Boston & Albany at Springfield, Mass., has been appointed general superintendent, with office at Boston, succeeding William J. Fripp, promoted. S. H. Clark, trainmaster at Albany, N. Y., has been appointed superintendent of the Albany division, with office at Springfield. Thomas G. Welch has been appointed a trainmaster, with office at West Springfield, and J. H. Relyea, trainmaster at Springfield, has been transferred to Rensselaer, N. Y.

The operating department of the Norfolk & Southern has been divided into three divisions, to be known as the Northern, Southern and Electric divisions. The Northern division will include all the territory north of Washington, N. C.; the Southern division all the territory south of Washington, N. C., and the Electric division will remain as at present. The jurisdiction of R. S. Anderson, superintendent at Norfolk, Va., has been extended to Washington, N. C., in charge of the Northern division. J. B. Hutchins has been appointed trainmaster of the Northern division, with office at Edenton, N. C.,

and R. E. Mason has been appointed chief train despatcher of the Northern division, with office at Norfolk.

O. M. Laing, superintendent of the Central New England at Hartford, Conn., has been appointed general superintendent, with office at Hartford.

W. J. Fripp, general superintendent of the Boston & Albany at Boston, Mass., has been appointed general superintendent of the Eastern district of the New York Central & Hudson River, with office at Albany, N. Y., succeeding Charles F. Smith, promoted. The Mohawk division has been transferred from the Western district to the Eastern district.

The Fort Wayne division of the New York, Chicago & St. Louis has been divided into two districts and will in future be known as the Fort Wayne district and the Chicago district. H. N. Williams has been appointed trainmaster of the Fort Wayne district, including Fort Wayne yard, and E. S. Kirby has been appointed trainmaster of the Chicago district, both with offices at Fort Wayne, Ind.

E. P. Bracken, general superintendent of the Wyoming district of the Chicago, Burlington & Quincy at Alliance, Neb., has been appointed assistant general manager of the lines east of the Missouri river, with office at Chicago. E. E. Young, superintendent of the Sheridan division, with office at Sheridan, Wyo., succeeds Mr. Bracken. F. G. Robbins, superintendent at Sterling, Colo., succeeds Mr. Young, and C. D. Peckenbaugh, trainmaster at Sheridan, succeeds Mr. Robbins.

Charles F. Smith, general superintendent of the Eastern district of the New York Central & Hudson River at New York, has been appointed general superintendent of passenger transportation of that company and the Boston & Albany, with office at New York. Mr. Smith was born on June 17, 1873, in New York, and from 1879 to 1886 attended the public schools in that city. He has been on the New York Central since November 11, 1886, when he began railway work as a messenger boy. The following year he was made a clerk in the superintendent's office of the Harlem division, and in 1889 he became stenographer to the assistant general superintendent and the general superintendent. A year later he was appointed clerk and timekeeper of the Hudson division, remaining in that position until 1893, when he was appointed secretary to the general manager. Two years later he was appointed chief clerk to the superintendent of the Western division, and in 1898 became chief clerk to the general superintendent. From 1902 to 1903 he was superintendent of passenger transportation, when he became assistant general superintendent. Leaving that position in 1906 he became general superintendent of the Eastern district, which position he held at the time of his recent appointment. He will have charge of passenger schedules and the distribution and assignment of all passenger train equipment, as well as general supervision of train service in the handling of baggage, express and United States mail, reporting to the assistant general managers of transportation of the above lines.

C. F. Smith.

Traffic Officers.

J. W. Thomas, general freight agent of the Jonesboro, Lake City & Eastern, with office at Jonesboro, Ark., has resigned.

H. B. Bryning has been appointed a traveling passenger agent of the Northern Pacific, with office at Kansas City, Mo.

Woodworth Clum has been appointed industrial agent of the Buffalo, Rochester & Pittsburgh, with office at Rochester, N. Y.

Charles J. Helber has been appointed a traveling passenger agent of the Wabash, with office at Denver, Colo., succeeding J. B. Muckle, promoted.

J. L. Bridges, city passenger agent of the Pennsylvania Lines at St. Louis, Mo., has been appointed a traveling passenger agent, with office at Dallas, Tex.

F. M. Williams has been appointed general freight and passenger agent of the St. Louis, Rocky Mountain & Pacific, with office at Raton, N. Mex., succeeding W. A. Gorman, deceased.

B. F. Nevins, commercial agent of the Denver & Rio Grande at Salt Lake City, Utah, has been appointed general live stock agent of the Western Pacific, with office at San Francisco, Cal.

F. H. Stocker, agent of the New York, Chicago & St. Louis at San Francisco, Cal., has been appointed manager of the Traders' Despatch, with office at Chicago, succeeding B. E. Morgan, resigned to accept service elsewhere.

M. J. Hannam, commercial agent of the Minneapolis & St. Louis and the Iowa Central at St. Paul, Minn., has been transferred to Minneapolis, Minn. B. F. Moffatt, traveling freight agent at Marshalltown, Ia., succeeds Mr. Hannam, and R. F. Salter succeeds Mr. Moffatt.

Robert H. Mills, general agent freight department of the Atchison, Topeka & Santa Fe at Philadelphia, Pa., has been appointed general eastern freight agent, with office at New York, succeeding James S. Bartle, promoted. C. D. Buxton, traveling freight agent, succeeds Mr. Mills, with office at Philadelphia.

Gerrit Fort, assistant to vice-president in charge of traffic of the New York Central & Hudson River, the Boston & Albany and the West Shore, at New York, has been appointed general passenger agent, succeeding J. F. Fairlamb, transferred. L. F. Vosburgh, general eastern passenger agent, has been appointed assistant general passenger agent, both with offices at New York.

George W. Squiggins, district passenger agent of the Baltimore & Ohio, at Baltimore, has been appointed assistant general passenger agent, with jurisdiction over district and traveling passenger agents east of Parkersburg, Wheeling and Connellsville, and will perform such other duties as may be assigned to him. E. A. Walton, formerly secretary to the president, succeeds Mr. Squiggins, both with offices at Baltimore.

R. W. Hockaday, general freight and general ticket agent in Kansas of the Missouri, Kansas & Texas at Parsons, Kan., has been appointed industrial commissioner, with office at St. Louis, Mo., and he has been appointed to a similar position on the Texas line, with office at Dallas, Tex. L. B. Chipley, commercial agent at Oklahoma City, Okla., succeeds Mr. Hockaday, and J. J. Hartnett, traveling freight agent at Oklahoma City, succeeds Mr. Chipley.

Charles I. Allen, general eastern agent of the Chicago, St. Paul, Minneapolis & Omaha at New York, having resigned, that office has been abolished. F. D. Robinson, traveling freight agent at Mankato, Minn., having resigned, H. N. Drummond, traveling freight agent in other territory, has been temporarily placed in charge of the freight traffic on the Minnesota & Iowa division north of Worthington, Minn., exclusive of St. Paul, Minneapolis and Minnesota transfer, with office at Mankato.

J. C. Burnett, division freight agent of the Atchison, Topeka & Santa Fe at Topeka, Kan., has been appointed an assistant general freight agent, with office at Topeka. B. F. E. Marsh succeeds Mr. Burnett. R. H. Mills, general agent in the freight department at Philadelphia, Pa., has been appointed general eastern freight agent, with office in New York, succeeding J. S. Bartle, promoted. Cameron B. Buxton, traveling freight

agent, succeeds Mr. Mills. W. P. Matchette has been appointed general agent, with office at Trinidad, Col., succeeding W. M. Smith, deceased.

Roland G. Brown, whose appointment as general freight agent of the Chicago, Rock Island & Pacific, with office at Kansas City, Mo., has been announced in these columns, was born June 9, 1865, in New York City. He received a high school education and began railway work in November, 1883, as messenger boy in the claim department of the Minneapolis & St. Louis at Minneapolis, Minn. He was then consecutively voucher clerk, investigator, rate clerk, chief clerk in the general freight office, traveling freight agent and assistant general freight agent. From April to June, 1902, he was secretary for the Wells Flour Mill Company at Wells, Minn. He then returned to railway work with the Burlington, Cedar Rapids & Northern at Cedar Rapids, Iowa, and went to Minneapolis a few days afterward as general northwestern agent of the Chicago, Rock Island & Pacific, when that company absorbed the Burlington, Cedar Rapids & Northern; in January, 1903, he was made assistant general freight agent at Minneapolis, which position he held until his recent promotion to general freight agent at Kansas City.

R. G. Brown.

James Webster, whose appointment as assistant freight traffic manager of the New York Central Lines West of Buffalo, with office at Chicago, has been announced in these columns, was born December 14, 1856, near Owen Sound, Ont. He began railway work in 1874 as telegraph operator on the Toronto, Grey & Bruce, now a part of the Canadian Pacific, and later went with the Great Western of Canada, now a part of the Grand Trunk. In 1882 he became a rate clerk for the New York, Chicago & St. Louis, and was then consecutively chief clerk, commercial agent and assistant general freight agent at Cleveland, Ohio. In July, 1904, he was made general freight agent at Cleveland, from which position he has recently been promoted to assistant freight traffic manager of the New York Central Lines West of Buffalo.

James Webster.

Engineering and Rolling Stock Officers.

J. C. Miller, district master mechanic of the Chicago, Milwaukee & St. Paul, with office at Milwaukee, Wis., has retired.

R. A. Klein has been appointed a supervisor of Division No. 1 of the West Jersey & Seashore, with office at Haddonfield, N. J., succeeding G. M. Ball, Jr., promoted. R. L. Kell has been appointed assistant supervisor of Division No. 3, with office at Millville, succeeding E. C. Silvius, transferred.

W. R. Hastings, general signal inspector of the Chicago, Rock Island & Pacific, has been appointed engineer of electric signals, with office at Chicago, succeeding E. W. Kolb, resigned, to go to another company; S. Misskelly, supervisor of signals at Rock Island, Ill., succeeds Mr. Hastings; G. W. Trout, acting signal supervisor at Trenton, Mo., succeeds Mr. Misskelly, and C. F. Duffy succeeds Mr. Trout, with office at Trenton.

J. E. Buker, having resigned as superintendent of car department of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley, to become first vice-president of the Chicago Car Heating Co., his former position has been abolished, and the duties of this position have been assumed by the superintendent of machinery. The position of J. M. Borrowdale, assistant superintendent car department, has also been abolished and Mr. Borrowdale will report to the superintendent of machinery and perform such duties as may be assigned to him.

L. A. Richardson, master mechanic of the Missouri division of the Rock Island lines at Trenton, Mo., has been appointed master mechanic of the Chicago terminal and the Illinois division, with office at Chicago, succeeding D. H. Speakman, transferred. R. L. Stewart, master mechanic of the Kansas City terminal and the St. Louis division at Armourdale, Kan., succeeds Mr. Richardson. E. J. Harris, master mechanic of the Iowa and Des Moines Valley divisions at Valley Junction, Iowa, succeeds Mr. Stewart. H. J. Osborne, master mechanic of the Nebraska and Colorado divisions at Goodland, Kan., succeeds Mr. Harris, and D. H. Speakman succeeds Mr. Osborne.

Purchasing Officers.

C. H. Kenzel has been appointed assistant purchasing agent of the Elgin, Joliet & Eastern, with office at Chicago.

H. A. Fabian, assistant to president of the New York, New Haven & Hartford and the Central of New England at New Haven, Conn., has been appointed to the new position of manager of purchases and supplies of the New York, New Haven & Hartford and the Boston & Maine, with office at Boston, Mass., effective March 1. He also holds the same position on the controlled lines of the New York, New Haven & Hartford, namely, Central New England, New England Navigation Co. and the street railways, the Connecticut Co., New York & Stanford Ry. Co., Rhode Island Co. and the Housatonic Power Co. as well as for the controlled lines of the Boston & Maine, namely, Maine Central, Washington County and the Sommerset Railway Co.

OBITUARY.

George B. P. Jackson, general attorney for Missouri of the Missouri, Kansas & Texas, with office at St. Louis, Mo., died in St. Louis on January 26.

Jackson Smith, vice-president of the Oregon Trunk Line, with office at Portland, Ore., died on January 28, at Portland, of heart disease. Mr. Smith was born in 1862 at Marion, S. C., and at one time was in the traffic department of the Atlantic Coast Line, and later was with the Isthmian Canal Commission in charge of the labor department at Ancon, Canal Zone, Panama.

James Keys, assistant engineer in charge of the bridge department of the Union Pacific, died at Excelsior Springs, Mo., on December 27, 1909. After graduating from the Lehigh University Mr. Keys entered the employ of the American Bridge Co. at Pencoyd, Pa., leaving that company to enter the bridge department of the Great Northern at St. Paul, Minn. In March, 1901, he was a designer in the bridge department of the Union Pacific, and had charge of that department at the time of his death. Mr. Keys was also vice-chairman of the committee on wooden bridges and trestles of the American Railway Engineering and Maintenance of Way Association.

Railway Construction.

New Incorporations, Surveys, Etc.

Arizona Eastern.—See Southern Pacific.

Buckhannon & Northern.—An officer writes that it has not yet been definitely decided when work will be started on a line from the west side of the Monongahela river in Pennsylvania at the West Virginia state line, southwest via Morgantown, W. Va., and Rivesville to Fairmont, about 35 miles. There will be a number of small bridges. J. T. Blair, president, and S. D. Brady, chief engineer, both at Parkersburg, W. Va.

California Roads (Electric).—C. E. Skinner, of Eureka, Cal., who is associated with residents at that place, is back of a project to build an electric railway from Eureka east to Redding or to Red Bluff. It is understood that the line will cost $7,000,000.

Canadian Pacific.—According to press reports from Winnipeg, Man., the Canadian Pacific is planning to spend $30,000,000 in western Canada during 1910 for extensions into new settlements, bridges, shops and double-tracking the main line.

Chicago, Memphis & Gulf.—An officer of this company, which was formerly known as the Dyersburg Northern, is quoted as saying that an extension is to be built from the southern terminus at Dyersburg, Tenn., south via Memphis to a point in Mississippi. Work is said to be under way from the northern terminus at Tiptonville, Tenn., northeast to Hickman, Ky., 21 miles. (April 9, p. 820.)

Chicago, Rock Island & Pacific.—An officer is quoted as saying that the company intends to eventually ballast the entire line between St. Louis, Mo., and Kansas City. The work includes widening all embankments, taking out depressions and filling in many long and high trestles. Some reinforced concrete culverts will be put in and about 100 miles of 85-lb. new rail will be laid. (Jan. 14, p. 113.)

Clarion & East Brady (Electric).—It is understood that the construction of this line is assured. The projected route is from Clarion, Pa., southwest via Reidsburg, Sligo and Rimersburg to East Brady. Connection is to be made at Reidsburg with the Franklin & Clearfield. There is to be a 600-ft. trestle at Reidsburg and three other trestles. (Aug. 16, p. 871.)

Dyersburg Northern.—See Chicago, Memphis & Gulf.

East Texas Traction.—Organization has not yet been completed by this company, which proposes to build from Dallas, Tex., east to Terrell, 33 miles. S. B. Marchall, president, Mesquite, Tex., and W. Crooks, engineer in charge, Scollard building, Dallas.

Gulf, Colorado & Santa Fe.—According to press reports, bids were recently opened for the construction of about 100 miles of line from Lometa, Tex., via San Saba and Brady to a point near Eden. Surveys have been finished and it is thought that the construction work will be pushed to early completion.

International & Great Northern.—According to press reports the Gould interests have under consideration the question of building an extension from Laredo, Tex., into Mexico, southeast through the states of Tamaulipass and Vera Cruz. It is thought that the line may be continued to the port of Tampico on the Gulf, or further south to the City of Mexico. It is said that about 120 miles of grading was furnished some years ago from Nuevo Laredo, Mexico, to a point on the Soto la Marina river, by the Gould interests. The government concession for the proposed line has lapsed. The line is to be built to control traffic which may otherwise be diverted over the St. Louis, Brownsville & Mexico, through a direct connection with the National Railways of Mexico via the international bridge now being built over the Rio Grande river from Brownsville, Tex., to Matamoras, Mex. Reports indicate that the bridge will be completed and ready for service about June 1.

Lackawanna & Wyoming Valley.—A contract is said to have been given to P. T. McGowan, of Avoca, Pa., for relocating about one mile of this company's line between North Pittston, Pa., and Dupont station. The work, it is understood, will include filling in about 25,000 cu. yds.

Memphis, Paris & Gulf.—According to press reports, contracts have been let for an extension from the present southern terminus at Ashdown, Ark., southwest to Clarksville, Tex., including a bridge to be built over the Red river. (Sept. 10, p. 478.)

Mexican Roads.—A consular report says that a concession has been granted by the Mexican government to John Henderson and P. Sandoval, both of Nogales, Sonora, Mex., for a line from Port Lobos, on the Gulf of California, northeast via Coborca to Sasabe, on the international boundary. The concession provides that no other railway shall be built within a zone of 29 miles wide, along the entire length of the line, and includes Port Libertad, the only adjacent available harbor in that section. Track must be laid on 20 miles by April, 1911. It is understood that construction work will be started early this year. (Oct. 29, p. 828.)

Minneapolis, St. Paul & Sault Ste. Marie.—Surveys are said to be under way for cut-offs as follows, between New Richmond and Sommerset, Wis., and between Owen and Marshfield. It is said it will take about two years to finish the work.

Muscatine North & South.—An officer writes that a franchise has been granted by the city council of Burlington, Iowa, and work can now be started on extension of the road from the southern terminus at Elrick Junction, Iowa, south to Burlington, about 25 miles.

New York Subways.—A report in favor of a double-decked subway for the Lexington avenue section of the Broadway-Lexington avenue route, which is projected from the Battery, in the borough of Manhattan, north to the borough of the Bronx, has been filed with the appellate division of the supreme court by the commissioners appointed to consider that particular change in the plans originally prepared. It is necessary for the appellate division to approve the change to obviate the necessity of again getting consents of abutting property owners. (June 25, p. 1545.)

Norfolk & Western.—According to press reports, this company has authorized improvements in the Columbia district to cost $1,500,000. This includes double-tracking work between Davis Station, Ohio, which is 10 miles north of Portsmouth to Piketown; change of line from Chillicothe to Delano, and extension of culverts, etc., along the entire line. Contracts for the work were to be let early this week. It is expected to have the double-tracking finished this year. (Jan. 7, p. 68.)

Oregon & Washington.—The Oregon & Washington has made public its plans for improvements on its Seattle, Wash., terminals this year. They include the completion of the main line into Seattle, the construction of terminal yards and freight tracks, the completion of the new passenger station at Jackson street and Fourth avenue south, and also the construction of twin piers with extensive dock and wharf facilities on the company's waterfront property between King and Weller streets. The work, it is estimated, will call for an expenditure of $4,000,000. At the Argo terminal yards 15.7 acres are being graded to the adopted grade. The requisite 140,000 yards of embankment are being hauled from the main line between Black River Junction and Argo. Fifty-nine thousand lineal feet of track will be laid here at the present time. A reinforced concrete roundhouse, machine shop, brick storehouse, yardmaster's house, turntable, pumping station with a complete water system for the terminal facilities, coaling plant and shop machinery will be installed. Grading on the main line from Black River Junction to Argo will be completed by March 1. The track will be in and the road in operation in April. There remains approximately $100,000 to be expended to complete this work. The main line into the passenger sta-

tion is already graded for a double-track from Argo to Canal Waterway, and this embankment will be extended north on Fifth avenue to the passenger station during the summer. The plans require an embankment containing 180,000 cu. yds. Coach cleaning and switching yards will be provided on this line so that when service is inaugurated into the permanent depot such equipment will not have to go into the Argo yards, as at present. Freight yards will be provided in the territory bounded by Dearborn and Atlantic streets, Railroad avenue and First avenue, including a modern reinforced concrete freight house 50 x 880 feet in size and a two-story office building fronting on First avenue and Dearborn street. Over five miles of track will be provided in the freight yards, as well as a Gantry crane, scales and all other accessories. The total expenditure on these facilities will be $250,000. Further extensions of branches and spurs will be built this year from the Argo yard to Kitsap avenue, extending to the harbor line between East and West waterways; a line will be constructed from the Argo yard north on Railroad avenue to the freight yards, and service tracks and switching tracks to a total of seven miles will be put in. The most extensive and modern interlocking plant in the northwest is being designed for crossings and will be installed within the next six months. The road is proceeding with all despatch in obtaining the right-of-way for the extension into Ballard, and recently received a permit from the War Department for its proposed bridge across the Salmon Bay waterway. This extension will necessitate the early commencement of the work on the long tunnel under Seattle, and involves some extremely extensive and heavy work around the precipitous bluffs west of Ballard. The length of this Oregon & Washington tunnel under Seattle will be 6,765 ft. It will be double-track. The estimated cost is $1,600,000. The contract for the passenger station on Jackson street, between Fourth and Fifth avenues, was let on October 15 to the Thompson-Starrett Company and all material is now on the way. The depot is expected to be completed by January 1, 1911. The present plans exceed in extent and design any of those formerly considered and the station is expected to furnish terminal facilities for many years to come In conjunction with building the depot, steel viaducts in Seattle boulevard, Fourth avenue, Jackson street and Main street are to be constructed at a total cost of $295,000, which, with the depot building, paving, umbrella sheds, driveways, etc., makes the total expenditure for passenger facilities alone $800,000.

As part, to some extent, of the terminal plans, the extensive retaining wall along the west line of Fifth avenue is to be constructed this year. Plans are complete and now in the hands of the city building department for inspection. It is proposed to make the wall of reinforced concrete, 1,681 ft. in length and of a maximum height of 49.4 ft.; it will contain 7,400 yds. of concrete and 766,000 lbs. of steel. Along its west side will be constructed a reinforced concrete bridge, with overhanging sidewalk. The total cost of this work will approximate $375,000. The final and detailed plans for the dock and wharf facilities between King and Weller streets are now receiving attention and requests for bids will be mailed within the next few weeks. Twin piers are planned, each 129 ft. wide and 800 ft. long, with a slip between of sufficient width to berth at the same time two of the largest vessels plying into Seattle. Each pier will have constructed upon it a modern warehouse, 95 ft. in width, containing the most modern appliances for the economical handling of freight and passengers. The slip will be dredged to a minimum depth of 40 ft., the material so dredged to be used in filling behind a bulkhead to be constructed well out beyond the present water line. Piling and all timbers subject to attack by teredos will be creosoted so that the work will be of the most permanent nature. The estimated cost of this work is $400,000. (Sept. 24, p. 564.)

PECOS VALLEY SOUTHERN.—Under this name a company was recently organized to build the line from Pecos, Tex., south to the Davis mountains, about 60 miles. The first section to Balmorhea, 36 miles, is expected to be finished by June of this year. A contract is said to have been entered into with W. L. Carwile, Dallas, to build the line. F. W. Johnson, W. D. Cowan, R. S. Johnson and H. Robins are said to be interested. (See Texas Roads, Jan. 28, p. 210.)

PENNSYLVANIA ROADS (ELECTRIC).—According to press reports a nine-mile electric line from Scranton, Pa., east to Moose lake is to be finished by May 1. The American Railways Co., Philadelphia, Pa., and Burke Bros. are said to be back of the project.

PRAIRIE FARM & SOUTHWESTERN.—An officer writes that contracts are to be let this spring to build from Prairie Farm, Wis., southwest to Glenwood or to Emerald, about 20 miles. Connection is to be made on the northern end with the Minneapolis, St. Paul & Sault Ste. Marie. The work includes three small bridges. G. E. Scott, president, Prairie Farm. (Jan. 28, p. 209.)

RALEIGH & SOUTHPORT.—Interests identified with this company are said to be making surveys from Fayetteville, N. C., southeast along the Cape Fear river for about 50 miles. It is understood that construction work is to be started about the middle of February. (March 19, p. 657.)

ROCKLAND COUNTY (ELECTRIC).—The New York Public Service Commission, Second district, has authorized this company to issue bonds amounting to $3,000,000. The company is also authorized to issue $1,050,000 of common stock. Of this, $415,700 is to be used for expenses in organizing and promoting the project, as well as for legal and engineering expenses. The proceeds of the balance of the stock and the bonds authorized are to be used for the construction and the equipment of the line. The company was organized to build 41.12 miles in the state of New York and 8.5 miles in New Jersey. B. A. Hegeman, Jr., president, and W. H. Coverdale, chief engineer, 66 Broadway, New York City. (Sept., p. 479.)

ST. LOUIS, BROWNSVILLE & MEXICO.—An amendment to the charter of this company is said to have been filed, authorizing two extensions, one from Bloomington, Victoria county, Tex., south to Port O'Connor, Calhoun county, 40 miles, and another from San Fordyce west to Roma, 35 miles. (Jan. 14, p. 118.)

See International & Great Northern.

SOUTHERN PACIFIC.—This company is said to have incorporated the Arizona Eastern, in Arizona, with a capital of $40,000,000. The incorporators include R. S. Lovett, E. Randolph, E. S. Ives, C. Walker, G. Taylor, of Tucson, Ariz.; B. Titus, D. H. Kadezie, M. M. Crocker and O. S. Lordsburg. The company proposes to take over the property and rights of the Arizona Eastern, Maricopa & Phoenix, Arizona & Colorado, Phoenix & Eastern and the Gila Valley Globe & Northern. The new company is to build from a point on the main line of the Southern Pacific through Arizona and western New Mexico to Durango, Colo., where the company has large coal deposits. Other lines are to be built to important cities in Arizona.

TOLEDO, ST. LOUIS & NEW ORLEANS.—An officer writes that contracts may be let in March to build this line. The projected route is from Carmi, Ill., south via Ridgway, Lawler, Karber's Ridge and Galconda to Brookport, opposite Paducah, Ky., about 95 miles. A branch is to be built from Galconda, west via Big Bay, Oaktown and Tamms to Thebes, about 50 miles. The work will be heavy and includes considerable solid rock work and some loose rock work. Grades will be $^{8}/_{10}$ per cent. northbound and one-half of 1 per cent. southbound. Maximum curvature will be 2 deg. on the Prairie division and 4 deg. on the Mountain division. There will be five steel trussed bridges and eight deck girders, also a tunnel 2,100 ft. long. N. M. Burns, president, 941 Pierce building, St. Louis, Mo. (Jan. 21, p. 165.)

TRINITY VALLEY & NORTHERN.—An officer is quoted as saying that an extension is to be built from Fouts, Tex., north to Rayburn, 15 miles. (Jan. 28, p. 213.)

UNION SPRINGS & NORTHERN.—Contract is said to have been given to J. W. Wright, Jr., Union Springs, Ala., for grading, track-laying and bridging on an extension from Fort Davis, Ala., northwest to Milstead, about 20 miles. The work is to be finished within four months.

WISCONSIN ROADS.—According to press reports from La Crosse, Wis., William Burke, of Witoka, Minn., is back of a project to build an interurban line from La Crosse west via Witoka, Minn., and Fremont to a point in southern Minnesota.

Railway Financial News.

Atchison, Topeka & Santa Fe.—See an item in regard to this company in General News.

Aurora, Elgin & Chicago.—Hayden, Miller & Co., Cleveland, have bought from the company $550,000 first and refunding 5 per cent. bonds. This makes a total of $1,950,000 of these bonds outstanding.

Buffalo & Susquehanna.—Fisk & Robinson, New York, who have acted as fiscal agents of the Buffalo & Susquehanna and a number of other properties, filed a petition in bankruptcy on February 1. The cause of the failure was stated to be that their properties were not developed far enough yet to carry themselves, and the firm, which was one of the very conservative bond houses of New York, was not able to dispose of the securities of its properties or to profitably dispose of high grade bonds which it largely dealt in. The firm owned $1,200,000 bonds of the Buffalo & Susquehanna Railway and $800,000 preferred stock of the subsidiary company, the Buffalo & Susquehanna Railroad. Other properties in which the firm took a large interest include the Gulf & Ship Island, the Louisiana & Arkansas, Kansas City Viaduct & Terminal and the New Orleans Great Northern.

Canadian Northern.—See Quebec & Lake St. John.

Erie.—E. H. Gary, chairman of the board of directors of the United States Steel Corporation, has been elected a member of the executive committee of the Erie.

Grand Trunk Pacific.—The company offered in London on January 13-19, £1,000,000 ($5,000,000) 4 per cent. debenture stock, ranking *pari passu* with £3,000,000 ($15,000,000) debenture stock outstanding. Interest is guaranteed on this debenture stock by the Grand Trunk on condition that the Grand Trunk itself has sufficient net income to pay such interest.

Great Northern.—Baring Bros. & Co., London, have bought and resold £2,000,000 ($10,000,000) St. Paul, Minneapolis & Manitoba Pacific extension 4 per cent. bonds of the Great Northern. This is the remainder of the £6,000,000 ($30,000,000) authorized in 1890. The proceeds of the bond sale are to be used to pay for work in progress and proposed.

Green Bay & Western.—The directors have declared an annual dividend of one-quarter of 1 per cent. on the $7,000,000 class B debentures, and regular dividends of 5 per cent. on the capital stock and class A debentures. In February, 1909, three-eighths of 1 per cent. was paid on the class B debentures and in February, 1909, one-half of 1 per cent. was paid.

Gulf & Ship Island.—See Buffalo & Susquehanna.

Illinois Traction Co.—See St. Louis, Springfield & Peoria.

Kansas City Viaduct & Terminal.—See Buffalo & Susquehanna.

Louisiana & Arkansas.—See Buffalo & Susquehanna.

New Orleans Great Northern.—See Buffalo & Susquehanna.

New York City Railway.—Receiver Ladd has brought suit against the Interborough-Metropolitan Co. as a stockholder of the Metropolitan Securities Co. to recover $7,348,000. The suit is the outcome of the receiver's failure to collect a judgment against the Metropolitan Securities Co. The suit against the stockholders of the Metropolitan Securities Co. is brought on the ground that the $30,000,000 stock of the company is not fully paid.

New York, Susquehanna & Western.—Holders of the Midland Railroad first mortgage bonds, which mature April 1, 1910, are offered the privilege on the payment of $95 in cash per $1,000 bond of extending these bonds to April 1, 1940, the extended bonds to bear interest at 5 per cent. J. P. Morgan & Co. offered to buy at par and interest prior to March 1 bonds of holders who do not wish to extend.

Quebec & Lake St. John.—A statement made by the Canadian Northern says in substance: The Quebec company has always been an unsuccessful undertaking. In 1901 its securities were reorganized and $2,433,333 4 per cent. prior lien bonds were authorized, the proceeds being applied to the reinstatement and maintenance of rolling stock and various other purposes. After a year's experience and a careful investigation of the accounts since 1901 we are satisfied that the position can only be gradually improved, even by the expenditure of a large amount of new capital, in extending the line and purchasing new rolling stock, and that not only is there no prospect of the company being able for some years to come to pay the interest on the prior lien and first mortgage bonds, but that it has not, in fact, earned the above interest in any year since 1901. We have carefully considered the present value of the assets, and are satisfied that, including the terminal and hotel properties, they are not worth more than the amount of the prior lien bonds. During the years 1901 to 1906 over $33,000 out of the prior lien bond moneys were used to pay rent for use of rolling stock and credited to operating revenue, thus increasing the gross receipts, and large charges to betterment account were met from the proceeds of prior lien bonds instead of being charged to revenue account, thus decreasing the charges against revenue. These charges include such items as interest on notes and mortgages. We do not wish to criticize the methods of the late management, but we would show the impossibility of any comparison between the accounts for the earlier years and the results achieved during the 18 months that we have had the management. (Jan. 14, p. 115.)

St. Louis, Springfield & Peoria (Electric).—This is an Illinois corporation, organized in December, 1909, which has bought and consolidated the St. Louis & Springfield, the St. Louis & Staunton, the Tri-City Traction and the St. Louis & Northeastern. The main line of the consolidated company runs from Springfield, Ill., to Venice, opposite St. Louis, 92 miles, with branches totaling 24 miles, a total mileage of 116 miles.

N. W. Halsey & Co., New York, bought from the company and resold $1,600,000 first and refunding 5 per cent. bonds of 1909-1939, principal and interest unconditionally guaranteed by the Illinois Traction Co.

Southern Pacific.—See an item in regard to this company in Court News.

Third Avenue (New York).—The sale of this property, which was originally fixed for September 2, 1909, and has since been adjourned from time to time, has now been ordered on March 1. The sale will be under the foreclosure of the first consolidated mortgage, which secures $37,560,000 4 per cent. bonds outstanding, interest payments on which have been in default since July 1, 1907.

Union Pacific.—See an item in regard to the American Express Co. in General News.

Wisconsin & Michigan.—The property of this company has been sold for taxes amounting to $67,990. The selling price just covered the taxes and interest. This road runs from Iron Mountain, Mich., to Menominee, 70 miles, with a branch to Peshtigo Harbor.

FOREIGN RAILWAY NOTES.

The government of Orange River Colony has decided to build the Sannah's Post-Wepener Railway. A line is also to be built from Bethlehem northward to the Transvaal.

Because of steep grades and sharp curves on the Cordoba & Northwestern, South America, the railway company has been authorized to relay its tracks with rails weighing 35 kilograms per meter (about 70 lbs. per yard).

The Minono Arima Electric Railway proposes to build an electric railway from Osaka, Japan, to Takaradzuka, about 15 miles, with a three-mile branch to Minoma. The work will cost, it is estimated, about $1,500,000.

Supply Trade Section.

The Griffin Wheel Co., Tacoma, Wash., is to enlarge its plant adjoining the Great Northern car shops.

S. G. Johnson has been appointed general sales manager of the Union Switch & Signal Co., Swissvale, Pa., with headquarters in New York.

The Illinois Steel Co. is to build a two-story office building at 1317 to 1325 Wabansia avenue, Chicago. The estimated cost of the building is $24,000.

The Atlantic Equipment Company, New York, has opened an office in Pittsburgh, Pa., at 2101 Beaver avenue, which will be in charge of H. Kleinhans, manager.

Callaway, Fish & Co., New York, on February 1, formed a co-partnership for the transaction of a general banking and commission business in stocks, bonds and investment securities, with offices at 37 Wall street.

The Covington Machine Co., Covington, Va., reports an increased demand for combination punches and shears. It has recently sold a triple combination machine to the Maryland Steel Co. for its plant at Sparrow's Point, Va. Arrangements have been made with the Wiener Machinery Co., New York, for managing the eastern sales office of the Covington company. A large stock of machines will be carried in Jersey City, N. J., in order to be able to make prompt deliveries.

The Isthmian Canal Commission will receive bids until February 14 for piles, split-sheave pulleys, cold-rolled shafting, car wheels, gear cutters, valves, pipe fittings, etc. (Circular No. 555.) Until February 21 for oil for locomotives, cars, stationary engines, marine engines, air compressors, etc. (Circular No. 557.) Until February 28 for boilers, pumps, universal grinder, steam trap, cable, vanadian steel chain, spiral riveted pipe and fittings, valves, etc. (Circular No. 558.)

Joseph E. Buker, who has been elected first vice-president of the Chicago Car Heating Co., Railway Exchange, Chicago, as stated last week, was born in 1859, and went to work in a railway shop on the Michigan Central at the age of 17. He served the Michigan Central for about 10 years and was then employed by the Atchison, Topeka & Santa Fe for about two years. His next position was with the Consolidated Cattle Car Co., a private car line located in Chicago, whose assets were later taken over by the Street's Western Stable Car Line. After about eight years in the service of this company Mr. Buker accepted a position in the mechanical department of the Illinois Central, in whose service he remained until February 1, 1910. In August, 1909, he was made superintendent of the car department. Mr. Buker has a wide acquaintance among railway and supply men.

J. E Buker.

A. L. Whipple has incorporated the Whipple Supply Company, New York, which was established in October, 1909. The new company, organized under the laws of the state of New York, has a capital stock of $50,000. The officers are: A. L. Whipple, president and general manager; R. L. MacDuffie, vice-president; H. E. Oesterrick, secretary and treasurer. Among the specialties controlled is the Hedley anti-climber. This device is applicable to steam railway passenger equipment and freight cars. In the application to freight cars the device will be in the form of the dead-woods formerly used prior to the adoption of the M. C. B. coupler. The company has offices at 50 Church street, New York.

RAILWAY STRUCTURES.

ASHDOWN, ARK.—See Memphis, Paris & Gulf.

BEAVER, PA.—The Pittsburgh & Lake Erie plans to rebuild its passenger and freight terminals.

BELLE PLAINE, IOWA.—Press reports state that the Chicago & North Western has prepared plans for a new roundhouse.

EDMONTON, ALB.—According to press reports the Canadian Pacific high level bridge to be built over the Saskatchewan river from Edmonton to Strathcona is to be 2,687 ft. long and 166 ft. from the river bed to the rail base. It will be supported by four main piers of concrete to the bridge seat, and on the Strathcona side there are to be 10 steel towers on concrete pedestals; a retaining wall is to be built at each end. The total estimated cost of the structure is $1,500,000. (Dec. 10, p. 1172.)

EVANSVILLE, IND.—A company has been incorporated in Indiana to build a bridge across the Ohio river above Evansville. The stockholders of the Evansville Electric Ry. are interested in the company and the bridge is to be used largely by this line.

GALVESTON, TEX.—An officer of the Gulf, Colorado & Santa Fe is quoted as saying that the company will make improvements at a cost of $100,000 at Galveston this year. This includes the construction of wharves on a portion of the company's 1,500 ft. of water front, which extends from Fifty-first street west to Fifty-seventh street.

JOHNSTOWN, PA.—The Baltimore & Ohio is said to be making plans for improvements, to include freight and passenger stations at Bedford and Baumer streets, and an extension of the freight shipping facilities at Washington and Franklin streets, in Johnstown. The work, it is understood, will be started soon and pushed to completion. The new freight and passenger stations will cost about $1,000,000.

NEW YORK.—Plans have been filed, for an addition to the large car house and inspection headquarters of the Interborough Rapid Transit Co., at Lenox avenue and 148th street. A two-story concrete annex, 95½ ft. long x 62 ft. wide, will be constructed. The improvements will cost about $30,000.

OMAHA, NEB.—The Omaha & Council Bluffs Street Ry. Co. has prepared plans for an addition to its car shops. The present shops are to be used for repair work and the addition, which will be practically a duplicate of the present plant, will be used entirely for new work.

OUTLOOK, SASK.—The Canadian Pacific has given a contract to the J. D. McArthur Co., Ltd., for the erection of a bridge over the South Saskatchewan river at Outlook. The bridge will be over 3,000 ft. long and 146 ft. in height, with 106 piers and pedestals. (Jan. 14, p. 118.)

REDDING, CAL.—The Southern Pacific plans to build a new passenger station during the year.

ROSEVILLE, CAL.—The Southern Pacific has prepared plans for three car shops, each 400 ft. x 500 ft. An additional roundhouse is also contemplated.

SEATTLE, WASH.—See Oregon & Washington.

TACOMA, WASH.—According to press reports plans have been made by the Harriman lines for extensive yards and car shops at South Tacoma. The improvements are to cost about $1,000,000.

TOLEDO, OHIO.—According to press reports, the Cincinnati, Hamilton & Dayton has started work on a new dock and is improving the yards at Toledo. The cost will be about $1,000,000.

Late News.

The items in this column were received after the classified departments were closed.

Directors of the Cincinnati Northern, controlled by the Cleveland, Cincinnati, Chicago & St. Louis, have declared an initial dividend of 3 per cent., payable March 1.

W. Hamilton has been appointed master mechanic of the western division of the Grand Trunk, with office at Battle Creek, Mich., succeeding E. D. Jameson, assigned to other duties.

The Norfolk & Western, reported in the *Railway Age Gazette* of January 7 as being in the market for 3,000 freight cars, has ordered 300 gondolas from the American Car & Foundry Co.

C. W. Goodyear, president of the Buffalo & Susquehanna, says that the officers of the company, knowing of the impending value of Fisk & Robinson, turned over some days ago to the Knickerbocker Trust Co. of New York drafts for the interest payments due February 1.

The Baker City interurban is said to have let contracts for work on the first section of a projected line from Baker City, Ore., and to form part of an interurban belt line 45 miles long in Baker valley. T. B. Neuhausen, president; F. A. Kribs and T. S. McGrath, all of Baker City, are interested.

The Wasioto & Black Mountain is now building from Wasioto, Ky., along the Cumberland river to the head of Tom's Creek in Harlan county, 12 miles. The line is eventually to be extended from Tom's Creek through a coal and timber section to Harlan, 24 miles. A. B. Gloster, chief engineer, Middlesboro. (Dec. 17, p. 1214.)

According to reports from Delta, Colo., contracts are to be let in about 60 days for a line from Delta through Surface Creek valley to Cedaredge, about 18 miles. An extension south is projected to Montrose and eventually into Paradox valley, as well as an extension on the northern end. The Delta County Business Men's Association, associated with northern Colorado capitalists, are said to be back of the project.

The Missouri, Oklahoma & Gulf is said to have given a contract recently to extend this line south to Denison, Tex. The contract includes building a combined highway and railway bridge over the Red river, to be finished by June 1. A site of about 50 acres of land is said to have been secured east to Denison for the tracks and buildings. When this work is finished the road is to be extended from the northern terminus toward Kansas City. (Dec. 24, p. 1261.)

Harold A. Haines, freight solicitor of the Pennsylvania Railroad at Reading, Pa., has been appointed Canadian freight agent, with office at Toronto, Ont., succeeding Louis J. Fox, resigned. John B. Large, district freight solicitor at Providence, R. I., succeeds Mr. Haines, with office at Reading, Pa. Walter S. Wells, traveling freight solicitor at Boston, Mass., succeeds Mr. Large, with office at Providence, and John T. Windsor succeeds Mr. Wells, with office at Boston, Mass.

The Philadelphia & Reading advises that no new equipment has been recently ordered, but that the company now has under contract the following equipment:

One thousand steel 55-ton coal cars, American Car & Foundry Company; 1,000 steel 55-ton coal cars, Standard Steel Car Company; 1,000 box 40-ton cars, American Car & Foundry Company; 500 steel low side 50-ton gondola cars, Cambria Steel Company; 20 vestibule passenger coaches, five vestibule combination cars, 25 open platform passenger coaches, five open platform combination cars and eight baggage cars, Harlan & Harlingsworth. All the above passenger equipment cars are to have steel underframe and steel superstructure sheathed in wood, making an entire composite car. The company is building in its own shops at Reading, Pa., 62 engines, as follows: Two Atlantic type passenger engines, 20 light consolidation engines for mine work, 10 four-wheel switching engines, weighing 56 tons each; 10 heavy ten-wheel engines, for fast freight service, weighing about 106 tons each; 20 heavy consolidation engines, weighing about 115 tons each, and 100 high-class refrigerator cars.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Baltimore & Ohio is asking prices on a number of locomotives.

The New York, Ontario & Western is in the market for six locomotives.

The New York, New Haven & Hartford is taking prices on 10 switching locomotives.

The Chicago, Milwaukee & St. Paul has authorized the building of 25 switching engines at the company shops.

The Commonwealth Edison Co., Chicago, has ordered one switching locomotive from the Baldwin Locomotive Works.

The Prairie Farm & Southwestern, Prairie Farm, Wis., a new railway building in Wisconsin, expects to buy motive power next fall.

The North Coast has ordered, from the Hicks Locomotive & Car Works, two 70-ton passenger locomotives. Delivery is specified for February.

The Chesapeake & Ohio is reported to have ordered two Shay locomotives from the Lima Locomotive & Machine Co., and one Mallet compound locomotive from the American Locomotive Co. This report is unconfirmed.

CAR BUILDING.

The Missouri, Kansas & Texas is making inquiries regarding 15 chair, 5 dining and 5 postal cars.

The New York, Ontario & Western has ordered 300 gondola cars from the American Car & Foundry Co.

The Missouri & North Arkansas has ordered 20 forty-ton freight cars from the American Car & Foundry Co.

The Chicago, Rock Island & Pacific has ordered 400 50-ton Hart convertible ballast cars from the Rodger Ballast Car Co.

The North Coast has ordered, from the Hicks Locomotive & Car Works, two 60-ft. combination coaches for immediate delivery.

The Missouri Pacific is said to be considering the purchase of a large number of freight cars, but early action is not expected.

The Prairie Farm & Southwestern, Prairie Farm, Wis., a new railway building in Wisconsin, expects to buy rolling stock next fall.

The Boston & Maine, reported in the *Railway Age Gazette* of December 10, 1909, as negotiating with the Laconia Car Co. for a number of cars, has ordered 2,000 freight cars from this company.

The National Railways of Mexico are in the market for 600 freight cars. The types include box, stock, gondola and flat cars. Four hundred are to be of 40 tons capacity and 200 of 50 tons capacity.

The Denver, Laramie & Northwestern is in the market for 50 forty-ton steel underframe box, 30 thirty-ton steel underframe stock, 50 forty-ton National dump and 20 fifty-ton Hart convertible cars.

The Swift Refrigerator Transportation Co. has ordered 100 thirty-ton produce cars from the Haskell & Barker Car Co., instead of from the Western Steel Car & Foundry Co., as reported last week. This company is now in the market for 75 tank cars.

The Pere Marquette advises that it is negotiating with the Pullman Co. for 20 first-class coaches, 8 baggage and 2 mail and baggage cars. These cars are to be 78 ft. long over platforms, 70 ft. over sills, and will have steel underframes. The company is also building in the Ionia, Mich., shops three first-class coaches with the same general dimensions as those mentioned above but with wooden underframes.

The Missouri, Kansas & Texas is in the market for 2,150 cars, as mentioned in the *Railway Age Gazette* of January 28. The number and types of cars included are as follows: 1,000 thirty-ton box, 300 thirty-ton, 50-ft., furniture, 200 thirty-ton automobile, 325 fifty-ton gondolas, 175 forty-ton gondolas, 100 fifty-ton flats and 50 cabooses. The flat cars and the fifty-ton gondolas will have steel underframes and the other cars will be all wood.

MACHINERY AND TOOLS.

See Isthmian Canal Commission under Supply Trade News.

The Hudson & Manhattan is in the market for a small number of machine tools.

The Chicago Great Western is in the market for five or six machines.

IRON AND STEEL.

The Boston & Maine is taking prices on 200 tons of bridge steel.

The Chesapeake & Ohio is reported to have ordered 1,000 tons of 100-lb. rails and 8,250 tons of 90-lb. rails from the Maryland Steel Co., and 11,350 tons of 100-lb. rails from the Illinois Steel Co.

The Delaware, Lackawanna & Western is in the market for 84 small signal bridges.

The Great Northern is in the market for 9,000 tons of steel for ore docks at Allouez Bay, Wis.

The Wabash-Pittsburgh Terminal Ry. is to be in the market soon for 500 tons of structural steel for a viaduct.

The Philadelphia & Reading has ordered 25,000 tons of rails and steel for 18 bridges for the Perkiomen Railroad.

The New York, New Haven & Hartford is in the market for 400 tons of bridge steel for a bridge at Sandy Hook, Conn.

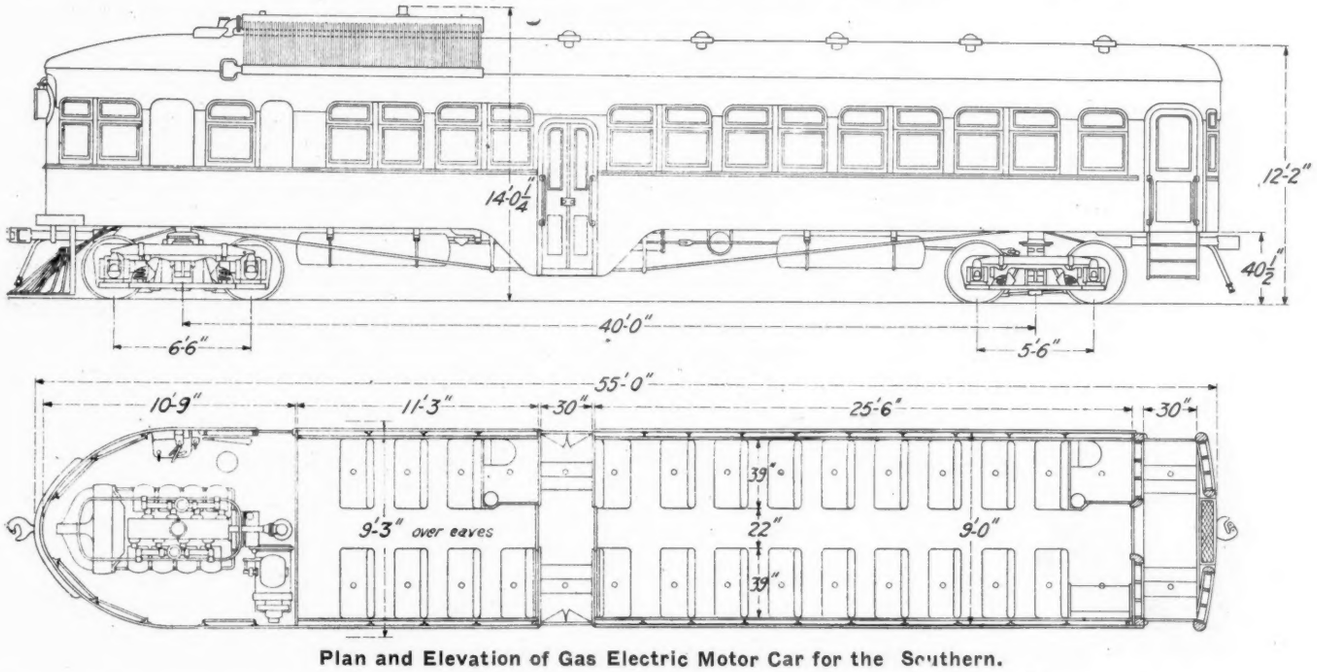
General Conditions in Steel.—There is a belief that the reports of the falling off of steel business in January have been greatly exaggerated, as is generally the case during periods of fluctuations in the stock market. It is said that steel manufacturers declare new business in January was up to expectations and that the tonnage received was but little short of the capacity of the mills. A lull in steel orders is always expected during January.

Gas Electric Motor Car for the Southern.

A brief description of gas electric motor cars, recently purchased by the Southern Railway from the General Electric Co., Schenectady, N. Y., and now under construction, will prove of interest to those railways which have similar service. These cars were designed with special reference to traffic conditions in the South.

The car is divided by a center entrance, the seating capacity forward of this entrance being 14 passengers and back of it 38. A rear entrance is also provided, thus completely dividing the forward and rear passenger compartments. The car body is 55 ft. long over bumpers, and of this length the engine compartment will require 10 ft. 9 in. The car body will have a steel frame, sheathed with steel plates and mahogany interior finish. The truck under the engine compartment will have a wheel base of 6 ft. 6 in., and will be equipped with M. C. B. 33-in. steel wheels. On each axle of this truck will be mounted a standard 100 h.p., 600-volt, box frame, commutating pole railway motor, type GE 205, thus giving the car a motor capacity of 200 h.p. The rear truck will have a wheel base of 5 ft. 6 in.

A direct-driven, eight-cylinder, type K, engine generating set will be placed in each compartment. Direct coupled to this engine will be an eight-pole, 600-volt generator, provided with commutating poles. This set will be mounted on a cast iron base, all parts being above the floor line and readily accessible. Current from the generator will be supplied to the motors through a controller, the function of which is to place the motors progressively in series and in parallel, and to vary the resistance in the shunt field of the generator by numerous steps, thereby varying the impressed voltage on the motors.



Plan and Elevation of Gas Electric Motor Car for the Southern.

The ignition is furnished by low tension magneto and magnetic spark plugs. The carburetor is of the overflow type, hot water jacketed. Compressed air is used for starting the engine, this being supplied through the several cylinders in succession through a distributing valve. Compressed air is supplied from a pump, direct-driven by the main crank shaft. A small auxiliary gas engine will drive an auxiliary pump to supply compressed air to the main reservoir. This gas engine is also direct-connected to a generator for lighting the car.

Combined straight and automatic air-brakes will be furnished, together with the usual auxiliary apparatus, and in addition to these brakes an auxiliary ratchet and handbrake is also supplied for emergency use.

The radiator is placed on the roof of the car, which provides sufficient means of cooling the engine on the thermocyphon principle. During cold weather hot water from the

engine circulating system will be by-passed through the passenger compartments.

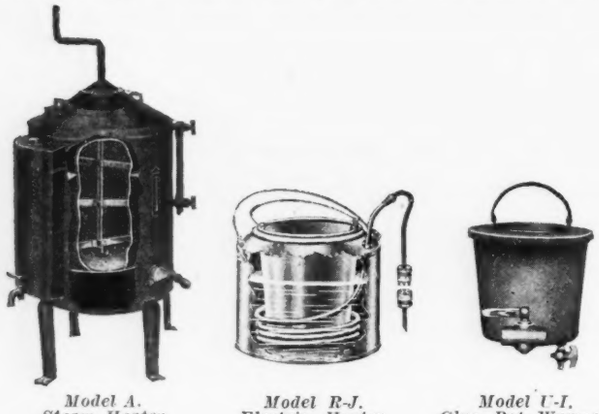
Although these cars can be geared for a speed of about 60 miles an hour on level track, such speeds are not usually required on branch line service, and the Southern car will be geared for a somewhat lower maximum speed. It is claimed that control and smoothness of acceleration are prominent features of this type of equipment, and that they are secured solely by reason of the gas electric drive principle which it embodies. As there is no mechanical transmission between the engine and the axle, the speed of the engine is not a function of the speed of the car; consequently, the gas engine may be operated so as to give its maximum output, irrespective of the speed of the car, a characteristic of the value in case of emergency or heavy work. It has been found that the electric equipment, consisting of the generator, controller and motors, and that which takes the places of the gears, chains, sprockets, clutches and other mechanical means of transmitting the power of the gas engine to the axle, is subject to very little maintenance expense, and the efficiency of this electric drive is said to be high. The feature, perhaps, which will appear most strongly to railway men is the simplicity of the control and the ease and certainty with which it can be handled by an unskilled operator

Wetmore Glue Room Appliances.

In the accompanying half-tones are shown two designs of glue heaters and a glue pot warmer.

The important characteristic of the model A steam heater is that it reduces the preparation and handling of glue from guesswork to a certainty. It is also claimed that it prevents glue from becoming sour; evaporation, with a consequent thickening of the glue; overheating, and formation of gum and crust. It keeps the glue clean and free from dirt and dust, and enables the operator to prepare and handle the glue in the shortest possible time. As the heater is made of copper and brass, very little wear results, except from misuse.

The model U-I glue pot warmer is for use at the benches of the various workmen. The warmers are attached to a steam pipe running from the boiler room. This heater is arranged so that the steam passes though a separate steam chamber and the piping so that any pot may be used while the others are turned off. The steam supply is regulated by a brass three-way valve. The glue pot, being made of copper,



Model A. Steam Heater. *Model R-J. Electric Heater.* *Model U-I. Glue Pot Warmer.*

Wetmore Glue Room Appliances.

is easily heated and kept clean. They are made in sizes having capacities from one quart to two gallons.

Model R-J electric heater is double jacketed, made of copper. The particular advantage of this electric glue pot warmer is in its having a third jacket which surrounds the water jacket. The space between the two outside jackets is packed with mineral wool, which serves to retain the heat. Electric current is turned on for from 15 to 35 minutes in the morning, and the glue is reduced to a liquid and remains in such a condition for several hours, when the current may again be turned on for five or ten minutes at a time.

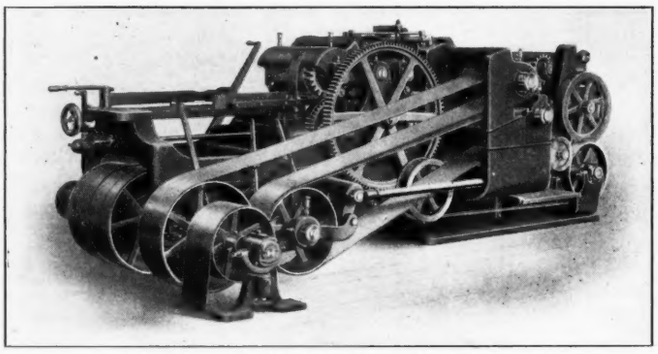
These Wetmore glue room appliances are manufactured by the Advance Machinery Co., Toledo, Ohio.

Recent Machine Tools.

A Departure in Planing Machine Construction.

The rapid production and high grade finish demanded in the output of the modern planing mill and car shop has made necessary and induced the adoption and development of new features of construction. The possibilities of perfect cutterhead work and rapid feed have only been appreciated within a comparatively short time, and the development of planing machines to take advantage of the latest devices is still more recent.

One of the obstacles to securing perfect cutterhead work was the difficulty of maintaining the cutterhead journals in



Woods' No. 20 Planer and Matcher.

perfect condition. The pull of the cutterhead belts under the strain may be as high as 1,500 lbs., and the speed 3,200 ft. per minute. It was found that under these conditions, with the increased size of belt necessary for fast feed, accuracy of adjustment of cutterheads was soon lost by the wear on the journals, proper lubrication of long boxes being difficult.

Another element of the difficulty was experienced in the vibrations and jars of the cutterheads caused by the belts on the shafts, this factor being one of the most serious and difficult of elimination. It was not unusual to see the mark left by the belt lacing on the stock each time that it went over the pulley. The difficulty of making two belts run alike also added to the troubles attending the method of belting cutterheads. The importance of the factor of belt slippage in the problem will be appreciated when it is considered that a difference of 0.01 of an inch in the diameter of the cutterhead pulleys means a difference of from 10 to 12 ft. in the amount of belt travel at the ordinary planing mill speeds, the difference being exaggerated by variations in thickness and tension of belts.

The necessity of the operator's working about the cutterheads in truing them off while they are running at full speed made their belting on the front or operating side of the machine somewhat dangerous, and accidents to operators have resulted from the breaking of belts while the operator was in the line of belting.

Convenience and accessibility on the operating side of any machine, allowing the removal of the cutterheads, taking out defective pieces of stock, etc., are desirable. To accomplish these results, to eliminate the objectionable features of belting upon the cutterhead direct, and of belting troubles generally, the S. A. Woods Machine Company, Boston, Mass., has developed its one-side coupled drive, in which one belt is used for each cutterhead, and the belts are placed on the back side of the machine, each driving a cutterhead pulley supported by boxes entirely independent of the cutterhead itself, a connection being made between the two by a flexible coupling. This coupling is claimed by the Woods company to effectually absorb all vibrations transmitted to the pulley by the belting, thus leaving the cutterhead journals without the strain of the belts or other disturbing influences. This improvement permits the use of very short journals upon the cutterhead, these journals being efficiently lubricated by improved oiling devices, thus rendering easy the maintenance of ideal running conditions. This design also makes possible the instant detaching of the cutterhead from the spindle,

leaving it free to be turned when setting up and without disturbing the belts in any way.

Though the driving of a planing machine from one side may be considered a radical departure from the construction in use so many years, this arrangement is said by the Woods company, which has embodied this and many other new features in its No. 20 planer and matcher, to be not only satisfactory, but decidedly an advanced step. This machine is built in two sizes, to work pieces 9 in. and 15 in. wide by 6 in. thick.

The S. A. Woods Machine Company has concentrated its attention upon wood planers, and the No. 20 is the practical result of this specializing and a concrete demonstration of the higher efficiency to be attained through such concentration. Millmen who are contemplating the installing of planers will do well to look into this new type of machine.

Niles-Bement-Pond 48-in., 300-Ton Double Car Wheel Press.

The pressure required for mounting and unmounting steel wheels on 50-ton axles is so high that the work is done very slowly by the old machines which were built for smaller axles and cast iron wheels. In designing a new car wheel press the Niles-Bement-Pond Company, New York, has made its maximum capacity 300 tons and provided a pump and plunger on each head so that the work can be done more rapidly and two wheels can be pressed on or off at the same time. The illustration shows that the tie bars are divided in the center; consequently, when two wheels are to be removed simultaneously, the couplings are removed from the tie bars and pressure applied to both rams which starts the cylinder beams back on the base plate, carrying the tie bars resistance post and the two wheels away from the axle. The cylinder beams themselves and the resistance posts are gibbed down to the base plate and slide on it.

In order to readjust the cylinder beams in the right position for removing another pair of wheels from their axles, auxiliary cylinders are cast in the main cylinder beam and are located just above the base plate, and by the use of city water pressure or compressed air the main cylinder beams are returned to their initial position.

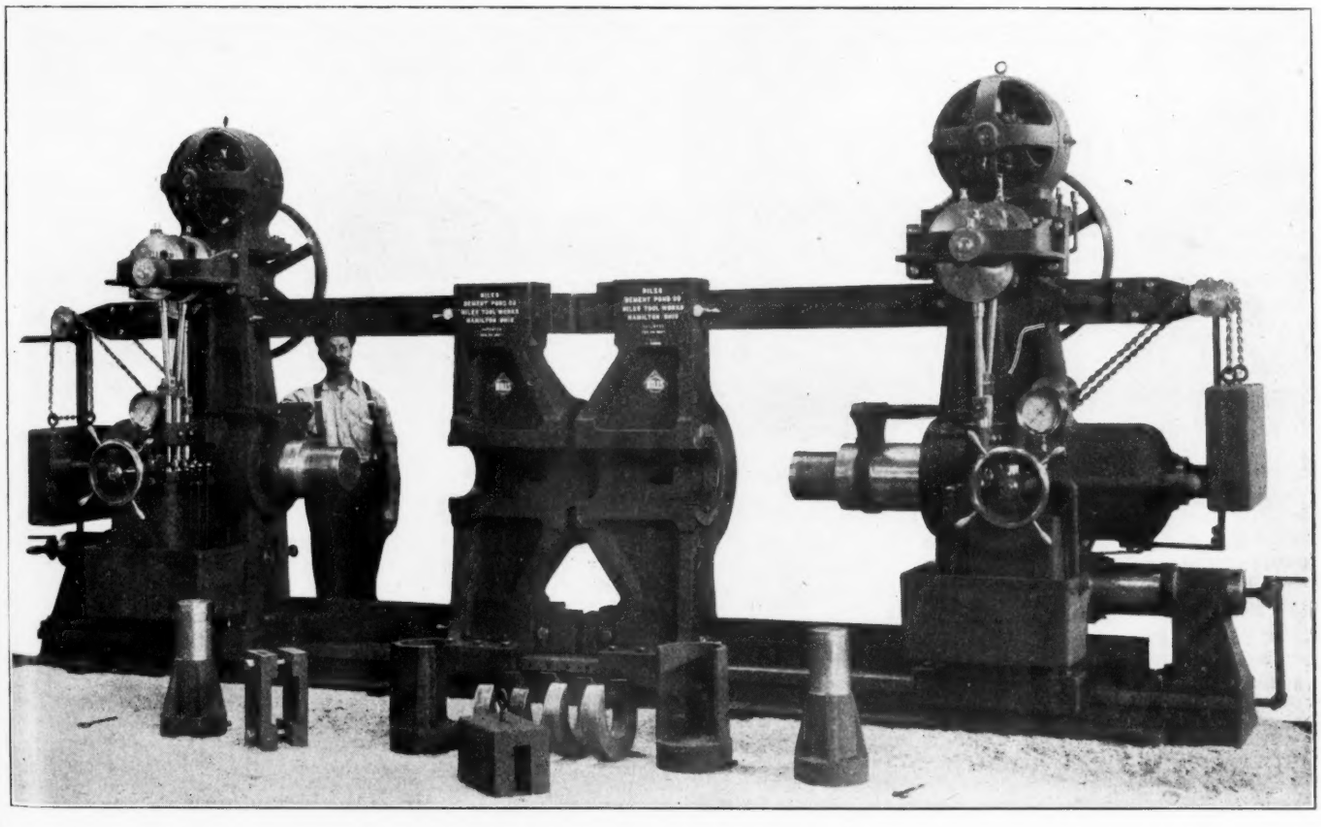
When two wheels are to be pushed on to their axles, the tie bars are coupled together and the work proceeds as in an ordinary press, except that there are two advancing rams at work simultaneously in place of one. The machine is shown arranged for this operation in the illustration.

The cylinders and sliding heads are steel casting, the cylinders being lined with copper tubing spun into place. Pistons are 11 in. diameter and are counterweighted for quick return when release valves are opened. Each ram is operated by a three-plunger pump, ¾-in., 1¼-in. and 1¾-in. diameter plungers, 4½-in. stroke, giving a variety of pressures that may be exerted on the ram with a maximum of 300 tons.

Each plunger is fitted with a weighted safety valve, which may be set to release at any pressure within its range, and each plunger is also fitted with a trip so that the advance of the ram is under perfect control without the starting or stopping of the motor.

The opening in the resistance head is 9 in.

The equipment includes forcing blocks for the rams for use when pressing off wheels as well as for pressing on wheels, operating valves for the control of city water or compressed air for adjusting the cylinder beams, also pressure gages, piping, water tanks, etc. The drive is by two 7½-h.p. motors, one mounted on each cylinder beam, transmitting power directly to the eccentric shafts.



Niles-Bement-Pond Double Car Wheel Press.

Tools for the Steel Passenger Car Shops at Pullman.

In the equipment of the steel passenger car shop, which was finished at Pullman, Ill., last year, there was a number of new and special designs for the Long & Allstatter, Hamilton, Ohio, tools used on steel sheets and structural shapes, some of which are here illustrated.

One of the largest and most interesting of these is illustrated in Fig. 1, the I-beam punching and coping machine, which is used principally for the long sills. This tool has a capacity for punching 8 holes $\frac{13}{16}$ in. through ½-in. material at each stroke.

It is equipped with an automatic variable feed spacing table for handling material 75 ft. long, which will space in multiples of $\frac{1}{16}$ in. up to 8 in. The machine has eight gag punch holders and an automatic index which shows the spacing of the punches to be used at the next stroke. The quadrant and levers, shown in the foreground, are operated in accordance with the figures in the index, and in this way the punches are properly spaced. The tool has a device for raising all the supporting rollers at the same time by power. It has also an auxiliary gag operating device which greatly facilitates the handling of the gags. The machine is directly driven by an electric motor.

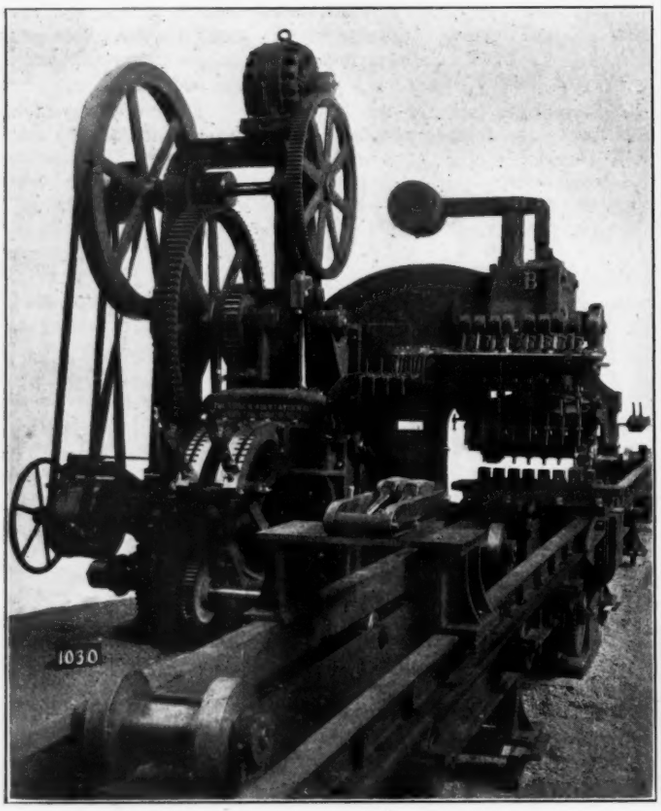


Fig. 1—I-Beam Punching and Coping Machine.

The horizontal punching machine shown in Fig. 2 is of special construction and has a capacity to punch a $\frac{7}{8}$-in. hole through $\frac{3}{4}$-in. material. Fig. 3 shows an angle iron shear mounted on a turntable. It has a capacity to cut 6-in. x 6-in. x 1-in. angles and is motor driven. Fig. 4 is an upright punching machine with a throat 50 in. deep. It has a capacity to punch 1-in. holes through 1-in. steel, and has 3 gag punch holders, an architectural jaw and overhanging die block. It is provided with a crane and is motor driven. The new Pullman equipment includes another similar punching machine, but with a throat 36 in. deep.

In the same shop there are a number of punches and shears built by Hilles & Jones Company, Wilmington, Del., which have special improvements adapting them to the work of building steel passenger cars, and some of them are here illustrated.

Fig. 5 illustrates one of three machines designed especially for punching plates, I-beams and channels. The depth of throat is 24 in. and the end punches are adjustable from 2½-in. minimum to 26-in. maximum distance, center to center. Each sliding head carries eight punches, and each punch is controlled by separate hand gag so that any single punch or any group of punches can be used as the work demands. The driving of each machine is by independent 12-h.p. motor di-

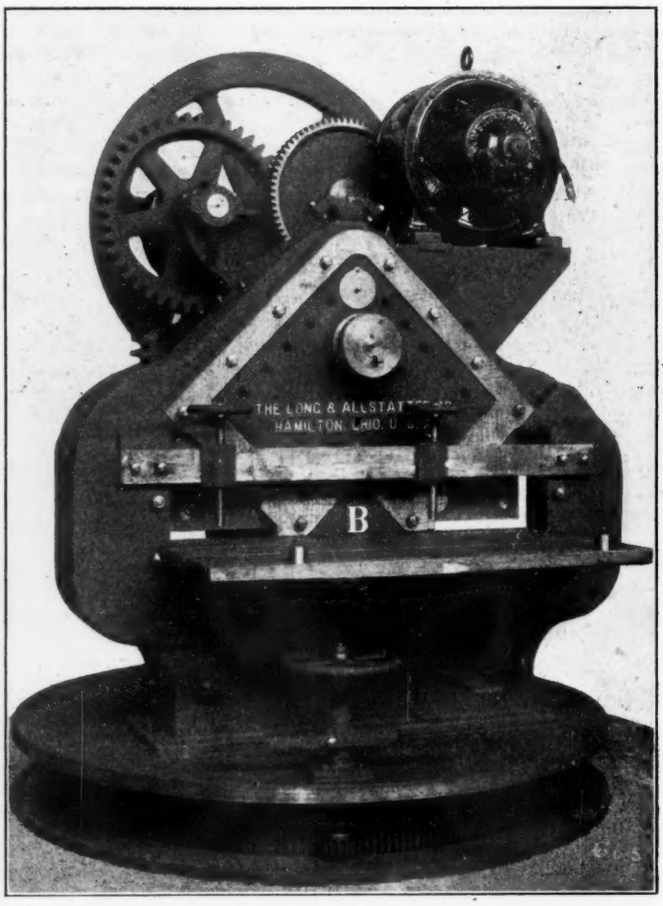


Fig. 3—Angle Iron Shear.

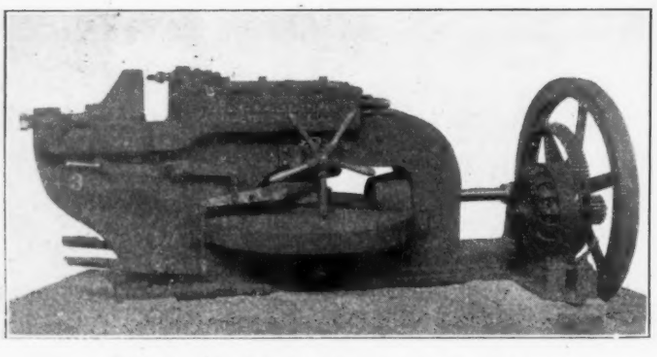


Fig. 2—Horizontal Punching Machine.

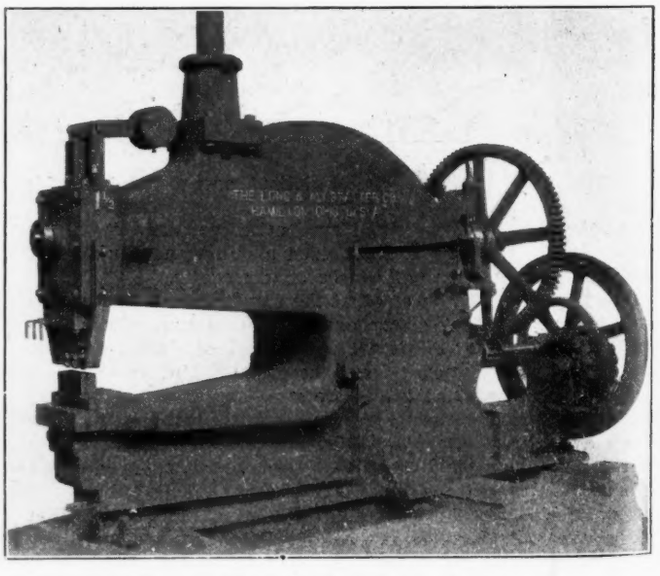


Fig. 4—Upright Punching Machine.

rectly connected to the fly-wheel shaft through cut gearing and friction clutch. This clutch allows the motor to be started and run to full speed before starting the machine proper. The clutch is controlled by an automatic stop operated by foot treadle and hand lever. The eccentric shaft is of forged steel

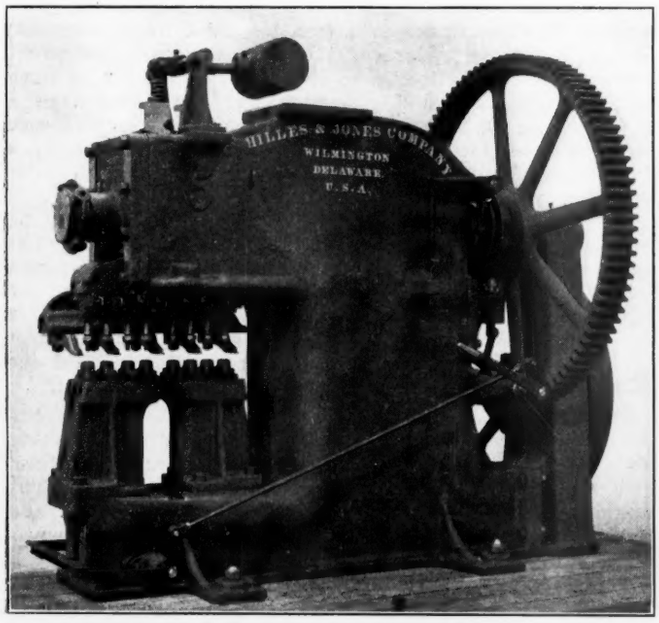


Fig. 5—Multiple Punching Machine.

running in bronze bushed bearings, the back end of the eccentric shaft being provided with substantial support bolted to the base of the machine. In addition to the eight punching attachments, one of these machines has a set of coping attachments for coping I-beams and channels up to 24-in. sections, inclusive. All of these machines were made duplicates with interchangeable punching and coping fixtures.

Fig. 6 illustrates a No. 1 single punch with 16-in. throat

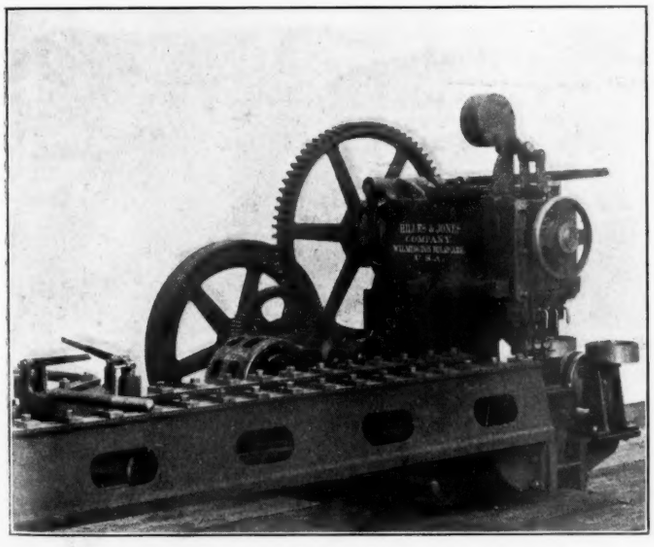


Fig. 6—Punch with Spacing Table.

depth, in connection with a special hand operated spacing table 75 ft. long. The punch itself is driven by a 5-h.p. motor directly connected to the driving shaft through cut gearing. The sliding head on this machine carries three punches and dies of different diameters so that an angle or plate could be punched with three different sizes of holes without loss of time in changing punches and dies. The spacing table is provided with two sets of adjustable stops so that one leg of an angle can be punched on the forward motion and the other on the return. The table is free-running and capable of being propelled by one man.

No. 7 shows a shear with 25-in. thoat, fitted with a revolving shear head and having a capacity equal to shearing 1-in. plates. Both the upper and lower blades are stamped

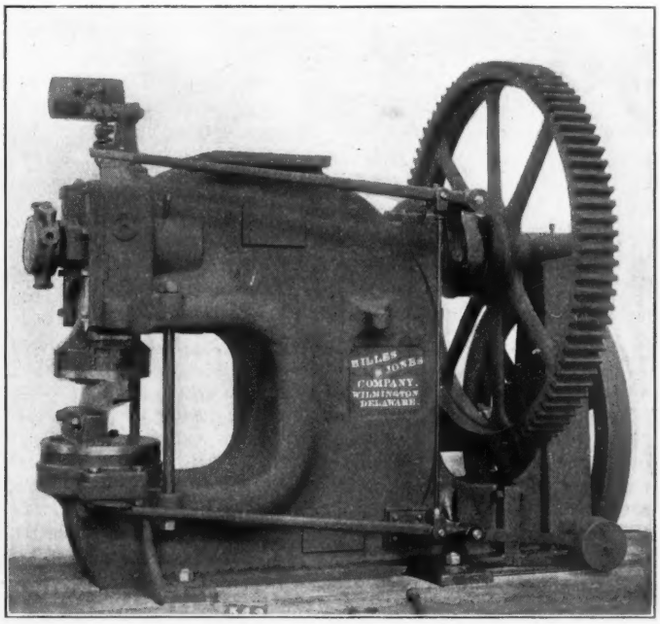


Fig. 7—Shear with Revolving Head.

with corresponding graduations and the detail of the head is clearly shown in the cut. This machine is driven by a 12-h.p. motor directly connected through cut gearing, the motor being on the opposite side from the view shown.

Another machine of interest in this plant is the gate shear which has a distance between housings of 146 in., and capacity to cut ¾-in. plates 12 ft. long at one stroke. It is driven by a 40-h.p. motor directly connected to the fly-wheel shaft through cut gearing and friction clutch. There is also a 25-in. throat punching machine of sufficient capacity to punch a 2¼-in. hole through 1⅛-in. thick plate. The sliding head is controlled by automatic stop so that the punch can be stopped automatically at any desired distance above the die.

American Triumph Planer, Matcher and Molder.

The accompanying illustration shows a planer, matcher and molder adapted for saw mills and small planing mills having limited room and power, and ones in which a machine is required for a large variety of work, such as planing and matching, beading, working flooring, ceiling, siding, casing, wainscoting and a large variety of molding and trim. The machine is very compact, being designed to economize space and withstand the hardest usage. Vibration, so common in small planers of this class, is reduced to a minimum, and the work turned out is said to be uniform and equal in quality to that of large expensive machines.

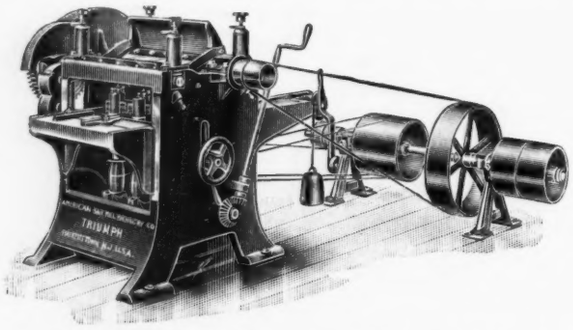
The main frame is amply proportioned and strongly ribbed, designed to insure the greatest strength and stiffness.

The table is cast in one piece and is deep and strong, being heavily ribbed and having arched braces on the under side. It is planed on top and has raised edges to prevent the material from leading against the side frames. The sides are long and placed far apart, being fitted to the outer edges of the main frame to which they are gibbed, thus securing the greatest rigidity and least possible wear.

The cylinder is made of special grade steel and is accurately milled on four sides, two of the sides being slotted to carry beading and molding knives in addition to the regular planing knives, which do not have to be removed when beading and molding is being cut.

The matcher spindles are unusually large and run in long,

babbitted boxes, ample provision being made for thorough lubrication. The matcher frames are also strong and are carried by 1 1/16-in. round steel guides at top and bottom, provision being made to easily take up any wear or lost motion. One of the matcher spindles is adjustable by a hand wheel at the



American Triumph Planer, Matcher and Molder.

side of the machine and has an eccentric clamp for securing it in any desired position. The matcher heads are made of bronze of standard design and will carry matcher, edger or molding bits 5/16-in. thick and up to 2½ in. wide. Shimer heads can be used when desired. Molding knives can also be used on the main cylinder where the cut is not over ⅞ in. deep. A heavy adjustable chip breaker is placed in front of the cylinder, which also acts as a hood. It may be swung back to expose the knives. Each matcher head has a chip breaker, one of which is self-adjusting.

An adjustable pressure bar prevents any vibration of material between the cylinder and matcher heads. This pressure bar and the front chip breaker may be set close to the cylinder for special smooth surfacing and can be set out so as to clear molding bits when used.

The feed is very simple, powerful and positive, with steel rolls 3 in. in diameter turned from the solid; the top feeding-in roll being fluted. The feed is driven by a belt from the countershaft, to which a belt tightener is attached, so that the operator can stop or start the feed at will. Two rates of feed, 35 ft. and 42 ft. per minute, are provided, and the change from one to the other can be quickly and easily made.

The illustration shows the machine double geared with both top and bottom rolls driven, but it is also furnished single-geared with the top rolls only driven. This machine is made by the American Saw Mill Machinery Co., Hackettstown, N. J.

Locomotive Cylinder and Piston Valve Chamber Boring Machine.

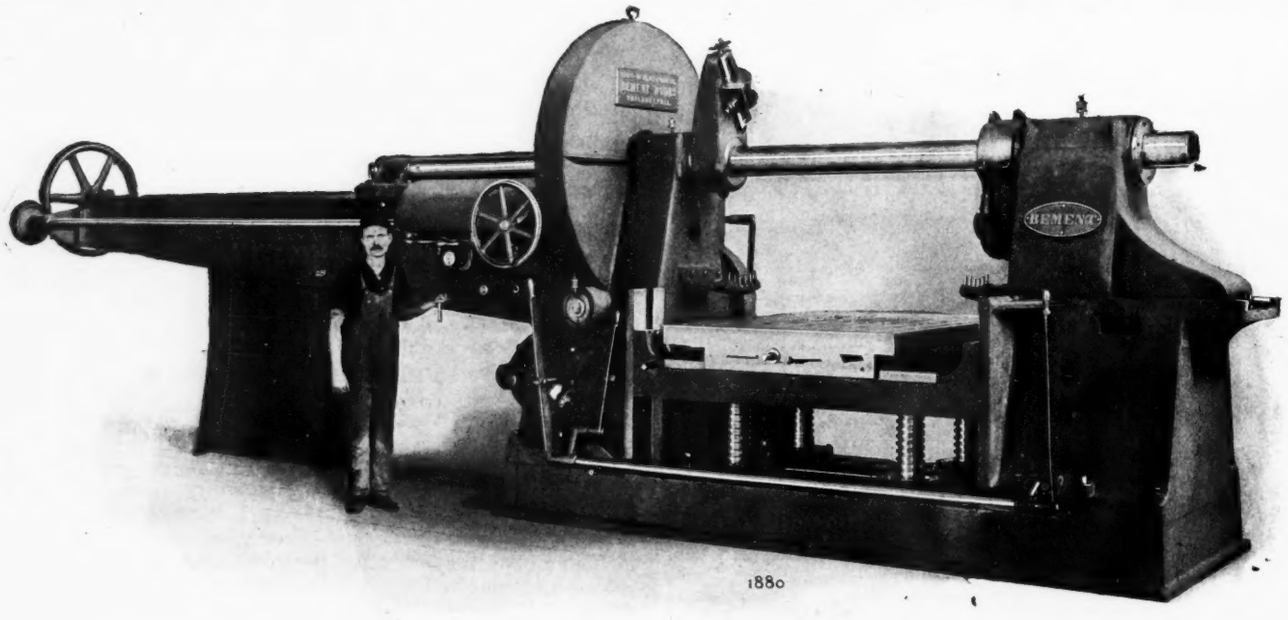
The accompanying illustration shows a machine designed to bore and face both ends of a locomotive cylinder at the same time, and it is one which will take cylinders up to 60 in. in length. The boring bar is a steel forging 7 in. in diameter, with a continuous traverse of 11 ft. by hand and a fast power traverse in either direction. The boring feeds, six in number, are automatic and reversible, and are actuated by a screw through a protected nest of gears. They are engaged, changed or reversed by conveniently placed levers. The screw feed is especially adapted for boring the interrupted parts of piston valves.

The main table is supported on four elevating screws, the nuts of which are revolved either by hand or power. The cross table is 54 in. wide in the direction of the machine's length and 72 in. long transversely. The top surface of the table has the necessary T-slots for clamping the work. It has a cross movement of 30 in. and a longitudinal movement of 18 in. The minimum distance from the center of the boring bar to the table is 30 in. and the maximum is 5 in.

The facing heads are provided with tool slides having compound motion, and they are clamped to the end of the sleeves with the boring bar. The automatic star feed is provided, and when not in use may be allowed to hang in place. The minimum distance between the facing heads is 20 in. and the maximum distance 60 in. The boring heads may be provided of various sizes to meet requirements.

The machine is driven by a 20-h.p. motor, geared directly with the reversing controllers. The raising and lowering of the table and the fast traverse of the boring bar is accomplished through this same motor.

This machine is made by the Niles-Bement-Pond Company, New York.



Niles-Bement-Pond Locomotive Cylinder and Piston Valve Chamber Boring Machine.

The absolute necessity for abundant coal supplies to use on warships and other vessels make the discovery of coal in Peru an incident fraught with importance. Some 1,500,000 tons are needed on the American Pacific coast for such purpose. Heretofore English and Australian coal has been used, the former costing $16 per ton and the latter about $14. Peruvian coal, 86 per cent. fixed carbon, found in large measure near the surface and within 75 miles of the coast, can be bought for from $4 to $6 per ton. This coal has been found to be satisfactory on the merchant marine and is now being experimented with on war vessels.